# THE CAREER PATHS OF COMPUTER SCIENCE AND INFORMATION SYSTEMS MAJOR GRADUATES

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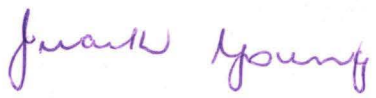

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## Abstract

This thesis examines the career movements of those graduating from the Department of Computer Science at the University of Tasmania, Hobart, between the years 1975 to 1995. Potentially, these graduates represent one of the key human resources as society moves into the 'Information Age'.

In support of a primary stated focus in careers in the IS industry, this study was based on multiple sources of data collection. The main survey, the graduate career survey, was based on a retrospective, longitudinal approach and targetted two aspects of career experiences. The analogy of a curriculum vitae was used to gather details of the work histories of these graduates. A second aspect of career experiences surveyed focussed specifically on the initial post-graduation appointment. There is considerable evidence to support that this stage in a career can prove highly influential in future career decisions, and so represents an important component in career research.

In relation to the graduate career survey, purposefully constructed analytic frameworks were applied to guide a structured analysis of the data for the two stated areas of career under examination. This approach provided a considerable insight into the career patterns of graduates through the application of different perspectives and levels of detail, to describe the practical employment experiences of graduates. It also revealed outcomes that have significant implications for IS career research in general. In particular, it has served to question the stereotypical image frequently attributed to IS personnel as being a highly mobile work force sector. The results of this research have also lead to the proposition that the work experiences of IS personnel should be seen as trajectories rather than rigidly defined paths. The 'Information Age' and the emergence of the protean career add support to this view.

This thesis has made a number of important contributions both to theory and practice. Essentially, as foundation research it has established a basis to promote IS career research to work towards addressing the current dearth of IS career research. It has also questioned some of the long-standing, yet largely unsubstantiated, perceptions of IS personnel in general, and careers in the information industry.

One important practical contribution of this research is that it has provided comprehensive feedback into the career experiences of graduates. Importantly, this represents a response to the recognised need, spanning nearly a decade, by both government and industry. These have all recommended that to address the chronic shortages of skilled IS personnel, such information is crucial to actively promote careers in the IS profession.

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# CHAPTER ONE: introduction

The research reported in this thesis examines the career experiences of computer science and information systems graduates from the University of Tasmania, with a particular emphasis on information systems careers. The primary aim is to address a widely recognised deficiency in the availability of information on careers in the IS industry. This problem has persisted even though it has been recognised by a number of significant sources that such information is not only desirable, but essential.

In America, which is the major source of research activity in relation to IS personnel, this deficiency has been recognised by eminent researchers in the field (Crepeau *et al.* 1992); (McLean, Tanner & Smits 1991); (Ginzberg & Baroudi 1988). In Australia, in the absence of any substantive empirical research, the problem has been almost exclusively addressed by the government and one of the major IS professional associations in this country. Between 1990 to 1995 three separate investigations sponsored by the Australian government (IIETF 1990); (DEET 1992); (ASTEC 1995) and one conducted in 1999 under the auspices of the Australian Information Industry Association (AIIA 1999b) have all identified and recommended the need for such information to be made available.

To begin this chapter, a broad outline of the following sections is provided. This is structured to achieve a logical progress of the sequences in the introductory stage of this thesis and is based on the following aspects:

- definitions;
- background;
- research objectives;
- research questions;
- research scope;
- contributions to knowledge.

## 1.1 Definitions

Before proceeding to consider the relevant issues in each of these sections, in keeping with the primary stated interest in this thesis in information systems careers, it is first necessary to define some terms that will be frequently used. Information systems (IS) and information technology (IT) will be used repeatedly. IS is a general term describing all operations and procedures involved in the design and implementation of information processing systems, whereas IT refers to the technologies that facilitate IS (DEET 1992). IS professional is a generic term to describe the work of those who support both IT and IS. Management information systems (MIS) refers to a specific application of IS, which is the provision of information, appropriately filtered to a level to facilitate managerial decision making. Similarly, MIS professional is another generic term used to describe IS professionals.

More generally, the term organisational behaviour (OB) will often be used, as will also be government business enterprise (GBE). OB describes the managerial stance within career theory, where the focus is on the leadership of employees from a

behavioural perspective. GBEs refer to government agencies that are operated as for-profit centres as a separate arm of public sector activities.

It is also useful at this point to define what constitutes a computer science or information systems undergraduate stream at the University of Tasmania. A major is an indicator of a specific stream of undergraduate study. While the rules in some disciplines stipulate a singularly focussed core curriculum, others offer the flexibility for graduates to choose electives from other areas. This is true in the case of both information systems and computer science graduates. At a third year undergraduate level they have completed a major in either stream of study that represents a unit weighting of a 50% of the award requirements, with the balance made up of a major from a range of available options. For example, while more commonly within a Bachelor of Science, a computer science major is associated with a major in mathematics, it could also be based on a major from a number of other academic discipline areas.

The term career path also needs to be clearly established. More generally, particularly within IS personnel research literature (Chesebrough & Davis 1983); (Applegate & Elam 1992); (Igbaria, Greenhaus & Parasuraman), this term is commonly applied to distinguish between technical and non technical streams within an IS oriented career. In the context of this present study, to meet one of the primary research objectives and gauge the extent of graduate involvement as IS professionals, of necessity an inclusive approach will be adopted. For the purposes of this research a career is described as the individual experiences gained over the course of working life. Individual experiences can be broadly divided into two areas. These are firstly career focus and secondly, work history mobility. Career focus relates to industry involvement with a specific emphasis on the extent of IS industry involvement. Work history mobility implies business sector involvement, geographical relocation, duration within specific appointments and change between employer organisations. This definition has been purposefully constructed to effectively address the research objectives stated later in this chapter.

## 1.2 Background

The aim of this section is to construct a context for the research providing the basis for this thesis. Here the initial goal is two-fold. Firstly, it builds a case to illuminate the perceived research problem. Secondly, different aspects of the research problem will be described, which further underline the importance of this research area and, in particular, the work presented in this thesis. It is proposed that the application of this approach will clearly establish not only the significance, but also the relevance and timeliness of this research.

### 1.2.1 The perceived research problem

Two major factors form the foundation for the identified research problem addressed in this thesis, these are:

- the dearth of IS career research;
- the chronic shortage of skilled IS personnel.

Together these factors represent an almost paradoxical situation. On the one hand there has been a persistent problem in the industry of an under supply of IS

professionals yet, on the other hand, even though the problem is significant, it has attracted minimal empirical research attention.

#### *1.2.1.1 The dearth of IS career research*

Even on a worldwide basis the careers of IS professionals has attracted only limited research attention (Crepeau *et al.* 1992); (McLean, Tanner & Smits 1991) despite the recognition that such work is overdue (Ginzberg & Baroudi 1988). McLean, Tanner and Smits (McLean, Tanner & Smits 1991) have pointed out the discrepancy between the size of knowledge base in relation to IS careers {and job attitudes} compared with the large number of people employed in the industry and the dynamic nature of the work performed. The major contributor to knowledge in the area is the Special Interest Group Computer Personnel Research (SIGCPR), a focus group within the American based Association for Computing Machinery (ACM).

There is a dearth of research dedicated to IS careers in Australia. In 1986 Daniel, Encel, Markus and Barnes (Daniel *et al.* 1986) described the information into careers in the IT industry as 'fragmentary'. An extensive search of the literature published in this country revealed very few examples of research dedicated to the careers of IS personnel. This is true both at a macro perspective and also in relation to studies of the initial employment experiences of graduates.

The sole two Australian examples that were located probably also represent the dominant perspectives of IS personnel career research in general. For instance, the first study located was an example of motivation research. Motivation has been identified as the primary topic for IS personnel research (Crepeau *et al.* 1992). Dengate, Couger and Weber (Dengate, Cougar & Weber 1990), extended the motivational work of Couger and Zawacki (Couger & Zawacki 1980) to compare the motivational characteristics of Australian and American IS personnel.

The second article located was a discussion paper produced under the auspices of the Research Foundation for Information Technology at the University of Sydney (Cameron 1991). It focussed on the supply and demand for computing professionals in Australia and is of relevance to a problem long associated with the industry, the chronic shortage of skilled IS professionals, the second factor contributing to the perceived research problem being addressed in this thesis.

Apart from research, facts about employment in the IT industry are provided by the Graduate Career Council of Australia and the Australian Computer Society. The annual Graduate Council publication is limited to describing the work circumstances approximately eight months after completion of a tertiary degree. It reports on the extent of the uptake of employment of graduates and also quantifies degrees according to geographical destination, industry, position and remuneration (GCCA 1993). Unfortunately this report excludes outcomes in relation to information systems graduates which, in Australia, has only more recently become a dedicated tertiary qualification. Over a thirteen year period, the South Australian Branch of the Australian Computer Society has annually published a guide to careers in information technology which mainly aims to attract pre tertiary students to careers in the IS industry (ACS 1998).

### *1.2.1.2 The chronic shortage of skilled IS personnel*

Worldwide, a feature of the advent of computing and the rapid diffusion of IT, is that it has created a seemingly insatiable demand for skilled IS personnel (Igbaria & Greenhaus 1992a). In Australia the shortage of these personnel has proved of concern for nearly thirty years (IIETF 1990); (Watson 1989). As the first commercial application of this technology in this country dates back to the 1960s (Kiegler *et al.* 1986), this means that the problem has been on-going almost since the beginning of IT in Australia (DEET 1992). Even despite its perceived limited employment opportunities, Tasmania has not been exempted from the problem. In the mid 1980s the rapid growth of the computer industry was projected as causing shortages of computer staff in the state (Lester 1980). Over a decade later this was still the case, a situation seen as being in part due to the migration of IS professionals to interstate where, apart from higher remuneration, there are also greater career and professional development opportunities (DCITA 1999).

IT has been described as a crucial component of the Australian economy (IIETF 1990), yet its growth is being constrained by a shortage of skilled human resources (Cameron 1991); (DCITA 1999). In 1995 Australia's Science and Engineering Base for Information and Communication Services and Technologies (ASTEC) presented a report that predicted a stage of accelerated growth which, in the earliest stages of the 21st century, information technology {and electronics} will emerge as one of the world's largest industries. Further, that the whole of industry and commerce will be pervaded by information and communications technology based systems (ASTEC 1995). This adds further support to an earlier forecast of a high demand for IT professionals continuing through to 1999 (IIETF 1993).

The extent of the shortage of skilled IS personnel is such that over a number of years the problem has attracted the attention of government, an IS professional association and a specifically convened task force forum to address the issues involved (Kiegler *et al.* 1986); (IIETF 1990); (Cameron 1991); (DEET 1992); (ASTEC 1995); (AIIA 1999b); (IT&T Skills Task Force1999). The magnitude of the sponsorship and scope of one of the studies commissioned clearly highlights the problem to be of considerable concern. The Information Industries Education and Training Foundation Ltd (IIETF) study provides tangible evidence of the acknowledged severity of the situation. A joint contribution between government and industry amounting to nearly $420,000 p.a. was funded to establish and maintain this body for a four year period. The major focus of this project was to address the crucial shortages of skilled computing professionals (IIETF 1990) which had persisted for many years (IIETF 1993).

The opening statement of the first IIETF report summarises the problem:

> This Report has been prepared against a background of continuing high demand for people skilled in IT, particularly computing professionals {and electronic engineers}, but few analyses of the nature of that demand or the ways of overcoming it (IIETF 1990:41-42).

There is little to indicate that the employment situation for skilled computing personnel will change. In 1999, based on the current Australian IS labour force of 360, 000, demand has been projected to the extent that in the next year an additional 31,000 IT personnel will be required. The three year prediction was for a further

increase of 89,000 workers, rising after five years to add another 180,000 to the demand for IS personnel (IT&T Skills Task Force1999). These figures do not take into account any decrease in the existing labour force due to retirements, employee movement to other business sectors or migration (IT&T Skills Task Force1999). More disturbingly, the problem of a shortage of skilled IS personnel is still forming the basis for government driven and industry investigations (DCITA 1999); (AIIA 1999b); (IT&T Skills Task Force 1999).

> The findings {of the IT& T Skills Task Force Survey} that, without urgent action, Australia's ability to become a leading on-line economy and participate in the Internet hypergrowth currently being experienced in the United States could be severely constrained. Demand generated by the move to an on-line economy is so strong and the pace of change so rapid, that traditional education and training systems cannot solve the problem in isolation. Industry, government and education/training suppliers must develop solutions together (Mr. Gerry Moriarty, IT & T Skills Task Force Chairman and Telstra Group Managing Director, Network and Technology) (AIIA 1999a:1-2).

There is a link between the paucity of IS career research and the chronic shortage of skilled IS personnel, the two major factors proposed as forming the basis of the research problem addressed in this thesis. A number of the investigations conducted in Australia to examine the shortage of skilled IS personnel have identified a need for career information to be made available to attract more people to enter the profession as a means of working towards a solution to the problem (IIETF 1990); (DEET 1992); (ASTEC 1995); (AIIA 1999b).These successive recommendations are summarised in Table 1.1.

**Table 1.1: A summary of relevant career information recommendations from government and industry commissioned reports support a need for IS career information**

| |
|---|
| **IIETF (1990)**<br>There is a clear need for better career information to describe the nature of work in computing and to give it a more positive image (IIETF 1990): 10. |
| **DEET (1992)**<br>**R7.1** IT departments should adopt the development and maintenance of quality education as a prime responsibility and commit to the development of an explicit quality assurance program to meet this responsibility. The nature of any program will depend on the individual institution, its circumstances and mission, but the following should be considered:<br>.....the involvement of employers and graduates to be directed towards assessment of the successes and difficulties experienced by graduates in initial employment, and two, five and ten years after graduation; (DEET 1992:43).<br>**R8.1a** The IIETF, working closely with Governments, institutions, industry, the professional associations and the school, should:<br>continue to promote careers in IT, providing information and advice to schools, students, parents and career advisers, paying special attention to make a career in IT more attractive to female students; and<br>ensure that career reference information and advice reflect a realistic view of future prospects for IT, and reflects changes in the nature of demand and course options.<br>**R8.1b** The AIIA , the ACS and the IEAust should encourage their members to promote IT as a career, in particular through direct involvement with schools, and through the preparation of careers information (DEET 1992:43).<br><br>*(ACS refers to the Australian Computer Society, IEAust is the Institution of Engineers, Australia and AIIA implies the Australian Information Industry Association)*<br><br>**R8.2** In order to attract a higher proportion of more able potential students, action should be undertaken by Government, institutions and industry to stress the importance of the human, as well as the technical aspects of an IT career. In this process emphasis should be placed on policies which will attract higher proportions of females (DEET 1992:43). |
| **ASTEC (1995)**<br>Current negative attitudes by younger people to careers in IT & C* are a threat to the future development of the industry in this country..... a better understanding of the career opportunities which these technologies offer needs to be developed (ASTEC 1995:101). |
| **AIIA (1999)**<br>**R 1:** The AIIA should examine existing strategies aimed at improving the proportion of female students entering the industry to identify those which have proven most effective, and should develop a program to support, develop and disseminate those strategies to its members. In the process, female career experience in the IT & T professions should be examined in more detail.<br>**R 5:** (a) Career planners and the community require accurate perceptions of IT & T experiences (both positive and negative). The AIIA should ensure that all of its material reflects this, and should encourage others in the industry to do likewise.<br>**R5:** (b) The AIIA should in particular identify and investigate potentially negative perceptions of IT & T careers.<br>**R8:** The overwhelmingly positive response from graduates in recommending careers in IT & T should be used by industry and education in advertising to potential students (AIIA 1999b:2). |

What is important to note in this table is that recommendations for IS career information to be made available have persisted for nearly a decade. Within these reports, while there is a common call for such information, it comes from a number of perspectives. The IIETF (IIETF 1990) report identified the high number of tertiary

students enrolled in computer courses who failed to complete their studies as a contributory factor to the under supply of skilled IS personnel.

The Report on the Discipline Review of Computing Studies and Information Sciences Education (DEET 1992) highlighted a need for IS career information in relation to course quality, student choice and selection and gender. In addition, it also drew attention to the need for information with regard to the initial employment experiences of graduates.

A need to change the current negative attitudes to careers in the IS industry was identified in the ASTEC report (ASTEC 1995) to motivate the view that IS career information should be made available, especially to attract high calibre students to the profession.

The Australian Information Industry Association (AIIA) Education and Training Forum supported a need for strategies to attract more female students to enter the industry. This report highlighted the need for longitudinal career research and also for accurate perceptions of IT and T (information technology and telecommunications) career experiences to be made available (AIIA 1999b).

In summary, this section has established, and substantiated, the background for the research presented in this thesis. It has reported the acknowledged dearth of IS career research which, in light of the chronic shortage of skilled IS personnel, make it even more imperative that this deficiency in knowledge should be addressed.

### 1.2.2 Reasons further supporting why the perceived research problem should be addressed.

Following the presentation of the perceived research problem, the second objective within this background section is to establish the relevance and timeliness of this research. This is seen as providing some insight into a number of other factors which individually contribute to support a genuine need for IS career research. In addition, when combined, these factors serve to enhance the significance of any work conducted in the area. Briefly these include:

- the impact of the 'Information Society';
- the ascribed characteristics of IS personnel;
- the emergence of the IS profession.

#### *1.2.2.1 The impact of the 'Information Society'*

In this sub-section, the aim is to construct a case to support that, even apart from the chronic shortage of IS personnel, this particular sector in the labour force is deserving of research attention. The initial basis for this argument is the change in society in the past thirty years and how this has influenced the nature of organisations. In turn this highlights the pivotal role of IS personnel in the modern business environment.

The notion that society has now entered the 'Information Age' establishes that the context of the research presented in this thesis is both topical and timely. It is an era when knowledge and information are defined as the essential and transforming resources (Bell 1979). Advances in technology, in particular computing and

communications, have resulted in the third industrial revolution (Finkelstein & Newman 1984) and the emergence of the post industrial society (Bell 1979). Society is said to be in a time when the pace of change has been described as unprecedented (Finkelstein & Newman 1984) to the point of being more rapid and dramatic than in any other period (Schuler & Walker 1990). While the first industrial revolution extended over two centuries, the second took place over two or more decades, the pace of the third has been described as 'overwhelming'(Finkelstein & Newman 1984).

*Information as a core resource*

Information acquisition and distribution have been identified as key processes for the survival of post industrial organisations (Huber 1984). In the new economic arena it is imperative for them to change to an information based organisation to retain competitiveness (Drucker 1988).

> The emerging 'Information Age' is transforming economic activity within and across nations, re-defining value chains and business systems. It is also speeding globalisation of trade, meaning larger markets, more competition and greater capital mobility. As with the industrial revolution, those companies which move quickly to derive economic advantage from these changes will survive and prosper, whereas those which do not will face increasing competitive pressure (DCITA 1998: 6).

Information has not only become an integral component in modern organisations, it has permeated all levels. The evolution of Management Information Systems, Executive Information Systems, and Decision Support Systems, for example, has facilitated information to be filtered to support strategic decision makers at the top level in organisations. In addition, advances in communications enables information sharing not just limited to geographical boundaries, but globally. The elimination of time buffers means real time data exchange on a worldwide basis (Huber 1984). As this infrastructure is largely implemented and maintained by IS professionals this clearly establishes their central role in the modern business environment.

*The pivotal role of IS personnel in the Information Age*

Given the explosive growth of the IS field over the last three decades (Igbaria, Parasuraman & Badawy 1994), Management Information Systems specialists have been described as not only a costly but a scarce human resource (Igbaria & Greenhaus 1992a), particularly in knowledge intensive industries (Jackson 1995). In economics theory an organisation is founded on three resources: physical, organisational and human (Jackson 1995). To a company these resources represent an asset and, as such, constitute a capital value. While all are essential components within an organisation it is the human resource, the people, that make it able to be adaptable, productive and, more importantly in the modern business environment, competitive advantage capable (Jackson 1995).The human resource is defined as human capital (Jackson 1995), the value of which is determined by the natural ability of a person and how this is developed over years of education (Sicherman & Galor 1990); (Barney & Lawrence 1989).

### *1.2.2.2 The ascribed characteristics of IS personnel*

The perceived characteristics of the IS labour force compared to other industry sectors is a further reason to justify the primary focus of this research in IS careers. Since the inception of the IS industry, and spanning nearly two decades, those

employed in the area have been identified as a distinct occupational group (Chandor 1976); (Jackson 1986); (Igbaria, Parasuraman & Badawy 1994). To compound the chronic labour force shortage, IS professionals are generally accepted to exhibit an above average job mobility (Bartol & Martin 1983). So in addition to the difficulty of recruiting suitably qualified personnel, it is often just as problematic to retain their services. As such the effective management of these personnel has been described as challenging (Leitheiser 1992); (Woodruff 1990) in that they present a unique set of problems for Management Information Systems executives (Turner & Baroudi 1986). However, there are those who would argue against this perception (Turner & Baroudi 1986); (Igbaria & Greenhaus 1992a); (Ferratt & Short 1988).

*IS Human Resource Management*

While careers and career planning have been recognised by those vested in managing IS personnel, Crepeau, Crook, Goslar and McMurtrey (Crepeau *et al.* 1992) stated that in this field there still remains a lack of attention to such issues. Apart from the fact many perceive that IS personnel necessitated the special attention of management, the essential nature of the IS work sector in modern organisations makes IS Human Resource Management one of the dominant management issues (Igbaria & Greenhaus 1992a). Human resources was the critical variable in data processing (Bartol & Martin 1982) as it was then known, as early as 1982, and is a critical success factor in modern organisations (Ginzberg & Baroudi 1988). In Australia, the result of a three-round Delphi survey conducted in the late 1980s showed that the IS managers of the top 200 organisations regarded specifying, recruiting and developing human resources as the second most important issue facing them over the following three to five years (Watson 1989). This issue was only surpassed in importance by strategic planning.

### *1.2.2.3 IS as an emerging profession*

Even apart from the previous reasons to support career research focussing on the careers of IS personnel, as a work force sector this group also offers an interesting research opportunity. These workers represent one of the most recent and, as yet, emerging professions. In terms of development as a profession, the Australian Computer Society was only recently been admitted into the Australian Council of Professions towards the close of 1999 (Anonymous 2000).

In a more traditional sense the IS profession is regarded as a para-profession. That is, unlike the older established professions, formal membership requirements and association guidelines are still evolving (Morrison 1969). From a formal qualification perspective, the earliest labour force involved people from a broader background in science. As the technology developed, a large proportion of computer personnel were workers whose skills and knowledge in the area were based on practical experience and familiarity with the technology, rather than formal qualifications. To a large extent this situation still applies today.

The introduction of computer science as an elective in tertiary education marked the beginning of formal qualifications in the area, and the move to recognition as a dedicated profession. For a number of years Computer Science was the single most important degree that prepared graduates to work in the IS industry. With changes in the nature of computing and the emergence of information as a key resource in organisations, a second stream of graduate was developed. The IS stream is more

focussed on broader skills, in particular a knowledge of people and business (Beise, Padgett & Ganoe 1991); (Israel 1990) which are now considered essential and integral components in the IS industry (Juliff 1998). This curriculum development is true of most Australian universities, where both streams of study are now available. In keeping with this, the Department of Computer Science at the University of Tasmania introduced an IT major stream in 1987. Consequently, the primary focus of this research in IS careers will present foundation work capturing the earlier application of commercial computing in Australia.

### 1.2.3 A summary of the issues contributing to the perceived research problem

The opening section in the thesis has conceptualised the research problem that forms the basis for this investigation. It began by establishing evidence to support a need for empirical IS career research. The argument was then extended to provide another crucial factor in IS employment: the problem of a chronic shortage of skilled IS personnel. Apart from these two core motivators, the advent of the 'Information Age', and the emergence of information as the core resource in modern organisations, clearly identified IS personnel as pivotal workers in this society. The fact that to many engaged in human resources, these employees are acknowledged as a unique work force sector and require special management attention further built a case for research with a primary focus in this area. From a historical perspective, the opportunity to establish career research in an emerging profession added yet another, and final, reason to substantiate the significance of the perceived research problem forming the basis for this thesis.

## 1.3 Research objectives

The purpose of this investigation is to examine the career paths of students who gained a bachelor degree based on a major in computer science or information systems at the University of Tasmania. The research aims to fulfill the following objectives, namely to:

1. determine the extent to which graduates with a tertiary level of skills and knowledge to enter the IS industry pursued dedicated IS careers;
2. determine the extent to which graduates intermittently engaged in IS positional roles during the course of their careers;
3. ascertain the extent and areas of alternative careers taken up by these graduates;
4. examine the career mobility of graduates and compare for any differences between career focus, undergraduate majors in computer science or information systems and careers established at different points in time within the twenty year sampling period;
5. explore the extent to which the career movement of these graduates has been internally or externally motivated;

and also to:

6. examine the first post-graduation career appointments of these graduates to determine the extent to which they initiated careers in the IS industry;

7. determine the extent to which these graduates embarked on their careers according to business sector involvement and geographical location;
8. examine the positional mobility in the initial post-graduation appointment;
9. gain knowledge of the criteria graduates commonly apply when seeking initial career appointments and the reasons that underlie the decision to accept a particular position.

## 1.4 Research questions

To achieve these objectives, two questions were posed in this research. The first aimed to gather data of the entire work histories of these graduates, while the second focussed directly on initial post-graduation employment. Each research question has been constructed with reference to the definition of a career established at the beginning of this thesis. Based on the premise that the experiences from the first appointment are highly influential in future career decisions and moves (McLean, Tanner & Smits 1994); (Kaufman & Spilerman 1982); (Thompson, Baker & Smallwood 1986); (Rosenbaum 1979a) fundamentally these two research questions are integral components within a career.

**Question 1: Career history**

*With a particular focus on career and work history mobility, what are the career experiences of graduates from the Department of Computer Science at the University of Tasmania who gained a bachelor degree based on a major in either computer science or information systems?*

This research question addresses the first five previously stated objectives of the research presented in this thesis.

Career focus encompasses objectives one to three. These objectives represent a direct response to the chronic shortage of IS personnel by determining the extent of uptake of IS careers, either continuous or intermittent, among suitably qualified tertiary graduates.

Work history mobility deals with objectives four and five. As established in the definition presented at the beginning of this thesis, work history implies duration within specific appointments, geographical location and change between employer organisations. Objective five provides a secondary source of data to enrich the understanding of career movement.

Basically this examines whether career moves were prompted by internal promotion or else the result of change to a new employer organisation. These last two objectives are directed at a further major problematic feature of the IS industry, the above average positional mobility of IS personnel.

**Question 2: Initial post-graduation appointment**
*With reference to the initial post-graduation appointment and with a particular focus on original career choice, business sector and geographic location, how did graduates approach gaining and accepting the position and what is the extent of their mobility when engaged in this role?*

This research question aims to meet the remaining research objectives, those numbered from six to nine. Research objective number six, together with the first research objective allow an opportunity to compare whether in fact there are different patterns of IS industry involvement based on entry level and more long standing career involvement. In light of the problem of a chronic shortage of skilled IS personnel, this is an important outcome for this investigation. In the event that the results demonstrate a majority of graduates who began their careers as IS professionals subsequently move to other industry sectors, then this could be indicative of a need for measures to increase retention of entry level IS employees.

Similarly, as with objective four, objectives seven and eight examine mobility but in relation to the initial career appointment. The purpose of objective nine is to gain a practical insight into how graduates have approached establishing their professional careers.

## 1.5 Research scope

To address these questions and support the orientation to IS careers, this research was based on three independent phases of data collection. The first two of which were regarded as preliminary, to the extent of building a solid foundation to support the stated primary interest of this research in IS careers. The different approaches to gathering data and also the sources of sampling are summarised in Table 1.2. A more detailed explanation of these approaches will be presented during Chapter Four later in this thesis.

What is important to note in this table is that the primary source of data collection (Phase Three) is based on a longitudinal approach. This has implications for the fact that within broader career theory, the need for more longitudinal studies of careers has been recognised (Sonnenfeld & Kotter 1982). In so doing, this approach also acknowledges that careers are dynamic and need to be looked at over time (Bailyn 1989).

**Table 1.2: An summary of the scope of the research conducted within this study**

| Phase | Aim | Approach | Source of data |
|---|---|---|---|
| **One** | gain initial insight into IS recruitment | cross-sectional questionnaire | human resource agencies |
| **Two** | gain insight into demand and also employment in the IS industry | longitudinal, periodic content analysis of IS recruitment advertisements 1975 -1995 | three newspapers: *The Australian* *The Age* *The Mercury* |
| **Three** | gather data of the work histories and initial career experiences of graduates | longitudinal, retrospective two part questionnaire | graduates from the University of Tasmania gaining computer science or information systems majors 1975-1995 |

In defining the scope of this research, in relation to the graduate career survey, it is necessary to point out that it is not the intention in this research to pursue gender issues in any detail. While the need to attract more women to the IS industry has been one of the key recommendations in the government reports quoted earlier (DEET 1992); (AIIA 1999b), it is proposed that a more immediate problem is to address the dearth of IS career literature. When this foundation work has been completed, it will then provide a basis for a consideration, and comparison, of the career experiences of male and female graduates.

## 1.6 Contributions to knowledge

The research presented in this thesis is original research in a highly relevant and topical area and will establish a foundation for future research. It encompasses data spanning a twenty year period and captures an insight into the early stages of employment in commercial computing and the beginning of the IS profession. Therefore, this research will also be of historical importance. More specifically, this research will make a number of important practical and theoretical contributions to knowledge.

### 1.6.1 Practical applications

The provision of a repository of career information, with a particular focus on IS careers is central to the practical contributions of this research. It is proposed that this information establishes a source of reference to provide feedback to:

- foster careers in the IS industry;
- assist the career decisions of personnel currently engaged in IS careers;
- offer organisations a means of comparing the work patterns of graduates between similar business sectors and different sized operations;
- provide organisations with some insight into recruitment from a graduate perspective.

The research reported in this thesis is both topical and comprehensive. In view of the shortages of skilled IS personnel, and while IS careers are a primary concern, it uses an open approach to encompass the career outcomes of graduates regardless of the

areas where they establish their careers. Consequently, the practical benefits gained as a result are applicable in a range of areas.

> A study of career patterns and mobility in any profession would seem to have multiple practical applications (Slater 1979: 1).

The data on which this study is based are drawn from the real life experiences of graduates completing computer science and information systems majors. Resultantly, this research provides a source of IS career information previously unavailable, despite considerable evidence spanning almost a decade to support a crucial need for information in the area (IIETF 1990); (DEET 1992); (ASTEC 1995); (AIIA 1999b).

A further practical application of this research is it can be used beneficially in working towards a solution of the chronic shortage of skilled IS personnel (Igbaria & Greenhaus 1992a); (IIETF 1990); (Cameron 1991); (DCITA 1999b). Potentially, it could be a basis to promote IS careers and increase tertiary enrolments in computer science and information systems.

Therefore, at a fundamental level, the first two practical applications make contributions to the key issues forming the perceived research problem forming the basis of this thesis.

The career information gained as a consequence of this research also offers the potential to foster careers in the IS industry. In particular, it will provide a source of information to attract potential entrants to embark on careers in the area.

> Even more basic and important is the need of potential and new recruits for information - both qualitative and quantitative - about their chosen occupation (Slater 1979:1).

The information gained from this research can also be usefully applied as a source of reference by both enrolling tertiary students and graduates about to embark on their careers. It demonstrates the range of career options available to graduates gaining majors in computer science or information systems. Most importantly, it conveys a message of the transportability of these skills, not just between industry but also career area. That is, unlike many other courses of study, these qualifications are not rigid determinants of career focus. While this can be construed as a negative outcome for the IS industry and its labour force shortages, it is suggested that it could also work to its advantage.

The flexibility of potential career options could encourage an increasing number of graduates to at least explore employment as an IS professional. Not only could this reduce IS personnel shortages, but increase the number of entrants to the IS industry. Ideally, this could lead to greater competition for positions and so ensure only those with the highest skills will succeed in becoming IS professionals.

It is also proposed that this research makes yet another positive contribution to the chronic shortage of skilled IS personnel, because it provides information about the extent and career areas taken up by graduates who have been lost to the IS industry. While the primary stated focus of this research is in IS careers, the inclusive

approach adopted means that alternative areas of career involvement of these graduates are also examined.

The information provided as a result of this research can also be used as a point of referral by people already engaged in a career. When faced with career decisions often these judgments must be made in isolation and lack the knowledge based on peer career movement, for example:

> Workers often wonder whether they and their work experiences are 'typical' or the 'norm'(Slater 1979:1).

IS career information is highly relevant for Tasmanian graduates as one dilemma they commonly face, particularly in relation to their initial career appointment, is whether to remain in their home state or relocate further afield. The availability of information on the experiences of earlier graduates affords an opportunity to determine patterns of movement in early and subsequent career appointments.

Further, IS career information is set to become increasingly important in relation to the shortage of skilled IS personnel in Tasmania (DCITA 1999b). Currently, the Australian government is implementing an initiative to build a viable economy in this island state where geographical isolation and small population have contributed to its continuing inexorable decline (Bell 1997). The BITS (build on information technology strengths) initiative will provide a $40m. grant to enable Tasmania to develop a core of business operations based in IT goods and services (DCITA 1999b).

While currently Tasmania is often behind the other major Australian population centres in the provision of professional development and career opportunities for IS personnel (DCITA 1999b), potentially this situation will change. The expanded employment opportunities in the IT sector that will be generated in this state as this initiative is established and implemented will make a source of IS career reference even more essential.

The career information from this research also offers a practical resource for organisations. It will provide some insight into patterns of graduate employment and allow comparisons of career movements between business sectors, different sized organisations as well as positional mobility. Access to such information could prove particularly beneficial when used as a benchmark to determine normative patterns of employee mobility within specific business sectors. For example, it will be possible to readily identify when the rate of employee mobility being experienced is above the average of that in peer business operations. Consequently, the information will provide an indicator when the mobility of employees has become significant to the point of being dysfunctional.

For organisations, another important aspect of this information is the means graduates use to seek their initial career appointment, and also the reasons supporting the decision to accept a position is also important feedback for organisations. This is highly relevant recruitment information where particular skills are at a premium, as is the case in the IS labour force.

### 1.6.2 Theoretical contributions

It is envisaged that this research makes a number of contributions to theoretical knowledge. It will provide:

- a new perspective of career research;
- a synthesis of broader career theory and a context for future IS career research;
- a response to the call for longitudinal career research (Sonnenfeld & Kotter 1982);
- a number of methodological contributions.

The research presented in this thesis will contribute a substantive body of work to an area where currently there is only very limited knowledge. In addition, it will provide an innovative approach in career research.

The original nature of this research will establish the foundation for future and more comprehensive research in the area of IS careers. It also has the potential to guide career research in other industry areas.

This research contributes to general career theory by providing a synthesis of the many approaches the term implies. Later in this thesis, it will be explained that career theory does not imply one, all comprehensive, theory. Basically, it involves a collection based on a wide range of philosophical stances and terminologies (Arthur, Hall & Lawrence 1989); (Nystrom & McArthur 1989); (Derr & Laurent 1989). This fragmentation has proved the major obstacle preventing the pooling and sharing of knowledge to maximise the power of career theory and the establishment of a coherent knowledge base (Hackett, Lent & Greenhaus 1991). This synthesis will provide a contextual framework to guide future career research which is not just limited to IS careers.

This research also contributes to knowledge through the application of a longitudinal approach. Later in this thesis also, the need for more extended, longitudinal career research will be supported. Briefly, in working towards the maturation of career theory (Sonnenfeld & Kotter 1982), the dynamic nature of a career makes it imperative that the one-time fit previously applied is no longer appropriate (Bailyn 1989); (Betz, Fitzgerald & Hill 1989).

This research makes three methodological contributions. It will demonstrate the application of:

- a curriculum vitae approach;
- analytic frameworks;
- event history analysis.

The present research applies the recommendation that the curriculum vitae is an effective source of data in life and work history investigations (Dex 1991). At the same time its application will be approached in a way to preclude a major problem experienced by one of the earlier career researchers. In the work of Slater (Slater

1979) the request for respondents to supply a current CV resulted in a dataset so diverse as to defy complete analysis of the data this approach generated.

This research contributes to methodological knowledge by demonstrating the application of multi level analytic frameworks which provide a structured means of analysing a complex and comprehensive dataset. These were developed and applied for each research question as a systematic approach to data analysis that allows the results to be reported from a number of different perspectives and levels of detail. More specifically these frameworks provide the results to be examined from four perspectives:

- Level 1 - overview;
- Level 2 - between graduation cohorts;
- Level 3 - between career streams;
- Level 4 - between career streams within graduation cohorts.

The research presented in this thesis also enhances IS career research by establishing the application of event history (survival) analysis as a means to accurately determine the length of time in positional appointments. While there is considerable support in the literature for its application in career and employment research (Allison 1984); (Willett & Singer 1991); (Yaffee & Austin 1994); (Devine 1998), apart from an undefined application of right censoring (Wagner & Benham 1993), there is no evidence of its use in IS career research.

## 1.7 Summary

In this opening chapter, the perceived research problem has been presented. A number of issues providing ample evidence that it should be addressed have been described. From this foundation the proposed research objectives have been defined, and two research questions formulated to achieve the desired outcomes. Finally, the perceived contributions, both practical and theoretical, as a consequence of this research have been provided.

Looking forward to the remainder of this thesis, as Figure 1.1 shows, broader career theory is the central topic in Chapter Two. The primary purpose of this chapter is to establish a foundation of knowledge and understanding into the notion of a career and the issues it encompasses. Within this, the various approaches that collectively make up the notion of career theory will be presented. Examples of general career research will also be examined. In support of the second research question posed in this thesis, the final section examines the initial post-graduation appointment both in terms of the broader career theory and research.

The objective of Chapter Three will be to review the limited literature base of IS career research and also to attempt to locate this area of career research with respect to the broader career theory. The outcome from Chapter Two and Chapter Three will then be applied to determine the theoretical background, perspective, scope and approach for this current research.

Chapter Four describes the research methodology. Within this portion of the thesis, the three phases of independent data applied in this thesis will be elaborated in detail.

The aim of Chapter Five is two-fold. Firstly, to establish a context for the results by reporting the demographic results from the graduate career survey. Secondly, the results relevant to the first research question posed in this thesis will be presented. Where appropriate, aspects of these results will be extended to also provide results from Phase Two in this research, the newspaper IS recruitment survey. The presentation of these results will be based on the application of a purposefully constructed analytic frame to accommodate the complex number of perspectives involved.

Chapter Six will address the results pertinent to the second research question. The approach will be similar to that applied in relation to the first research question. That is, a second specially developed framework will be used to guide a structured approach in reporting this portion of the results. In addition, relevant results from Phase Two will also be included.

Chapter Seven will provide a comparative summary of various levels of analysis from the preceding results. The objective of this chapter is two-fold. Firstly, to summarise and refresh memory of the earlier results. Secondly, to establish an intermediary link between the results and the discussions to follow in the final chapter.

Chapter Eight will bring together the outcomes from this research. As depicted in Figure 1.1, the four major objectives will be to draw together the findings from this research as they specifically related to each research question, conclusions, discussions and, finally, directions for future work.

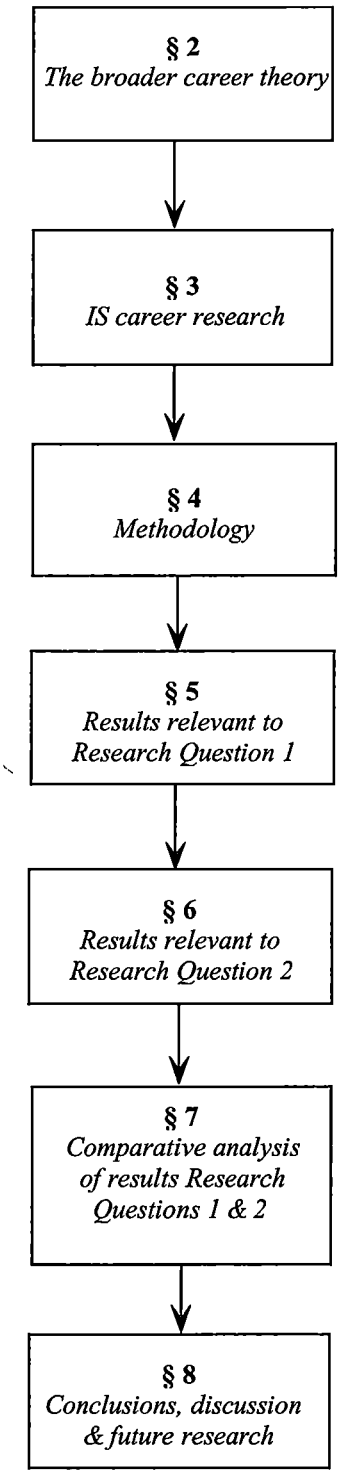


**Figure 1.1: A summary of the remaining chapters proposed in this thesis**

# CHAPTER TWO: the broader career theory

## 2.1 Introduction

The aim of this chapter is two-fold. Firstly, to establish a background of career research within the context of this thesis. Secondly, to provide a synthesis of the broader career literature which will later be considered in light of IS career research. The areas of career research that will form the basis for the review presented in this chapter are:

- traditional career theory;
- general career theory research;
- initial post-graduation appointment.

This approach has been adopted as it is advantageous, because of the limited availability of studies into IS careers, to go back to the very foundations that underpin career research.

The following quotation from Ginzberg and Baroudi (Ginzberg & Baroudi 1988) provides ample evidence to support this approach:

> What becomes very clear, when we consider the literature on DP/MIS careers in the light of the broader literature on organisational careers, is how little is known of the career dynamics of IS personnel. Worse, what is regarded by many as 'known' may be very misleading (Ginzberg & Baroudi 1988:549).

It is further substantiated in the view from broader career theory that:

> If scholars are serious about understanding people at work, then career theory remains a critical forum for developing both abstract and practical ideas about this subject (Arthur, Hall &Lawrence 1989:20).

Further, from an IS viewpoint, Myers (Myers 1991) recommends that those engaging in IS personnel research have much to gain by drawing on literature from other fields. For an emerging field, the major benefit is that pitfalls mapped out by earlier researchers can be avoided. In addition, this approach also provides an opportunity to compare IS and non-IS data, so gaining the ability to examine outcomes between the broader theory and that dedicated to IS personnel. Within this, a researcher is able to identify overlap in the issues frequently addressed and, more importantly, gaps in the focus of IS career research.

It is proposed that the beneficial outcomes from addressing these three areas of career research are:

- the construction of a synthesis of a highly fragmented and complex theory to establish a substantive background context for the research reported in this thesis;

- the development of a framework to enable existing IS career research to be located with reference to the broader career theory;

- the provision of a guide to identify potential perspectives in future IS career research.

### 2.1.1 Definitions

Before moving to examine the various aspects of career research, it is first necessary to establish that the term career can take a number of different forms. Kanter (Kanter 1989) defines three principal career areas:

- bureaucratic;
- occupational;
- professional and entrepreneurial.

These may not be necessarily mutually elusive and can occur as parallel processes.

***The bureaucratic career***

The first form of career more commonly relates to appointments in large organisations. It is defined as flows of people between positions in an organisation (Gaertner 1980). A bureaucratic career is said to represent:

> the individual's sequence of experiences, roles, and relationships in work-related organisations (Dalton 1989:89).

***The occupational career***

The second form of career can be defined as:

> a very general category referring to a patterned path of mobility wherever it may take people geographically, organisationally, and socially while following a certain type of work (Glaser 1968:1).

***The professional/entrepreneurial career***

The third career form is mostly is pursued in an entrepreneurial context.

> The logic of professional career structures is defined by craft or skill, with monopolisation of socially valued knowledge as the key determinant of occupational status, and 'reputation' the key resource for the individual (Kanter 1989:510-511).

What these definitions do serve to highlight is that, for the most part, the notion of a career is founded on the interaction of two distinct and complex factors, the individual and the organisation. They also demonstrate that the themes in these career forms have been incorporated as components in the definition of a career as applied in the research reported in this thesis.

Further, it is also useful to note that Nicholson and West (Nicholson & West 1989) made a distinction between the terms career and work histories:

> We recommend use of the more neutral term 'work histories' to denote sequences of job experiences and reserve the term 'career' for the sense people make of them (Nicholson & West 1989:181 ).

Consequently, with reference to these definitions, for the purposes of this research a career is described as the individual experiences gained over the course of working life. Individual experiences can be broadly divided into two areas. These are firstly career focus and secondly, work history mobility. Career focus relates to industry involvement with a specific emphasis on the extent of IS industry involvement. Work history mobility implies business sector involvement, geographical relocation, duration within specific appointments and change between employer organisations.

### 2.1.2 Career directions

In addition to these definitions, Driver (Driver 1979) described four possible directions that a career could take:

- transitory - a random path where there is no specific career objective;
- steady state - where an individual is locked into a specific area of career focus;
  (mostly describes those who embark on professional or trade careers);
- linear pattern - the main objective is to progress upwardly
  (in particular this is relative to those aiming at assuming corporate management levels);
- spiral - where different paths evolve as a cyclic process.

What career directions serve to highlight is that it is unrealistic to make a common assumption that all people in the employable age category, are necessarily oriented to career success or even simply a career (Derr 1986). This supports the necessity of the adoption of an inclusive view for career research where the objective is to gain an holistic insight into work histories of computer science or information systems major graduates.

## 2.2 Traditional career theory

As outlined in the introduction, the objective in the first major section of this review chapter is to examine career theory as a general concept. The aim of this approach is to establish a broad contextual background to serve as a foundation for the present study. Within this, the evolution of career theory will be described, followed by a brief description of a range of research approaches this involves. It is proposed that this approach will serve to the establish the fragmentary nature of career theory, and also demonstrate the range of underlying issues it encompasses. At the same time, however, it must be stated that the scope of what this could potentially involve is beyond the limitations of this thesis and indeed is acknowledged as complex even for those with a considerable expertise in the topic (Bailyn 1989); (Montross 1981).

In its widest context, a career is based on an effective working relationship and mutual satisfaction for both organisation and employee. This association is based on notions of reciprocity (Arthur & Kram 1989), congruence (Schein 1978) and match or goodness of fit (Betz, Fitzgerald & Hill 1989). Obviously, the success of this contractual arrangement depends of the quality of the relationship between the employer organisation and the employee.

The duality of structure underlying career theory has given rise to the concept of internal and external careers. The internal (subjective) career focuses on the characteristics of the individual and includes personal attributes such as motivation, talent and values. The external (objective) career describes the opportunities and inhibitors of the organisational environment (Derr 1986). This division supports the view that career theory encompasses two areas of career research. The first is that of developmental psychology, while the second, organisational behaviour theory, considers careers with the external factors influencing career outcomes. What developmental psychology and organisational behaviour career theories entail will be elaborated later in this chapter.

The potential complexity of the interactive effects between organisation and the individual contributes to the recognition that career theory is unique and powerful (Dalton 1989). This does not mean to imply that there is one comprehensive and all-encompassing career theory. To the contrary, the term describes a collection of theories stemming from a broad range of philosophical bases. It encompasses a disparate collection of theories which, due to its multi-disciplinary nature, is also highly complex. Not only are divergent issues addressed, but often the terminologies are incompatible with endeavours anchored in partially inharmonious values and beliefs (Nystrom & McArthur 1989). Historically, this division has existed for the last fifty years with independent and sometimes contradictory streams of thought hampering a unified development of theory and research (Derr & Laurent 1989).

> The volume and diversity of research, coupled with the tendency for studies to be divorced from theory, created and still creates a situation in which it is difficult to integrate findings across studies, thereby impeding the accumulation of a coherent knowledge base (Hackett, Lent & Greenhaus 1991:13).

The concept of a career is divided according to its theoretical and philosophical stance (Arthur, Hall & Lawrence 1989) which, for the most part, determines the preferred variables and the career issues addressed (Sonnenfeld 1984). Accordingly, this has precluded a comprehensive theory of career development (Montross 1981) and consequently, has limited the explanatory power of career theory. In recent years however, this problem has become more widely acknowledged and support is gathering for a unified approach (Arthur, Hall & Lawrence 1989).

> The dialectic nature of career dynamics calls for an epistemological framework that can address this ontological duality {careers link individuals to the social structure by fusing the objective and the subjective, the observable facts and the individual's interpretation of their experience} in a comprehensive manner (Derr & Laurent 1989:454).

While IS career researchers have been encouraged to draw on organisational career literature (Ginzberg & Baroudi 1988); (McLean, Tanner & Smits 1991), it is essential to first gain some understanding of the issues involved when adopting this approach. Clearly, the scope and number of potential interactions based on theoretical context, philosophical stance, the organisation and the individual are extensive, and as such beyond consideration in the context of the present literature review. This is not to imply that all research should adopt a holistic approach, but rather to show that when career research is conducted, regardless of where it stems from, that it should have the benefit of a framework to locate it in context (Derr & Laurent 1989).

> {all of these} issues and concerns can and have been addressed from a number of different perspectives. They cut across social, psychological and biological levels of analysis. Ultimately, they can be understood fully only when studied within a model that recognises the interaction of multiple relevant characteristics of individuality with multiple contexts and environments across the life-span of the individual. Clearly this represents a most comprehensive and extremely complex requirement, one that inevitably must lead to the conclusions that the study of vocational and career development must not be isolated from the study of other domains of human function and must take place from an interdisciplinary perspective (Vondracek, Lerner & Schulenberg 1986:2).

### 2.2.1 The evolution of career theory

Career theory had its origins in sociological research conducted towards the end of the 19th century. This period is significant because not only did it mark the beginning of a new and increasingly important research area, at the same time it established sociology as a modern behavioural science (Sonnenfeld & Kotter 1982). About the same time, the psychological measurement of individual differences was being applied. This provided the basis for the foundation of trait-factor theory which, in turn, later contributed to the development of career typology theories (Betz, Fitzgerald & Hill 1989); (Super 1981). To the present time these early roots in sociology and psychology have continued to be the dominant forces within career theory.

In the intervening period, since the foundation of career theory, the scope of research has extended to a wider philosophical base and, although not limited to, it has attracted the attention from areas such as economics, political science, history, geography and management science (Pfeffer 1989).

Super (Super 1981) has identified three theoretical approaches for the two major streams of career theory, psychology and sociology. These are decision making, matching and developmental theories. He saw the first, decision making, as cutting across the other two theoretical approaches. While Super (Super 1981) contends the primary basis of career theory in these disciplines is that of decision making it is important to note though that matching and developmental theories are two separate underlying approaches.

### 2.2.2 Psychological career theory

Figure 2.1 provides a graphical introduction to the psychological approach to career theory (vocational psychology). The dashed box outline has been used to highlight this area of career theory in a wider contextual background. Before proceeding to describe the areas of career theory within psychology, this context will need to be established as this will be repeated when different approaches will be presented in the sections to follow. The left hand side of this diagram shows the evolution of career theory according to time. This encompasses nearly a century in which, driven by the emergence of the 'Information Society' traditional career has given way to modern career theory. The concept of the protean career will be explained later in this chapter. A parallel development over this timeframe has been a move away from a static approach to one that recognises a career as a dynamic phenomenon.

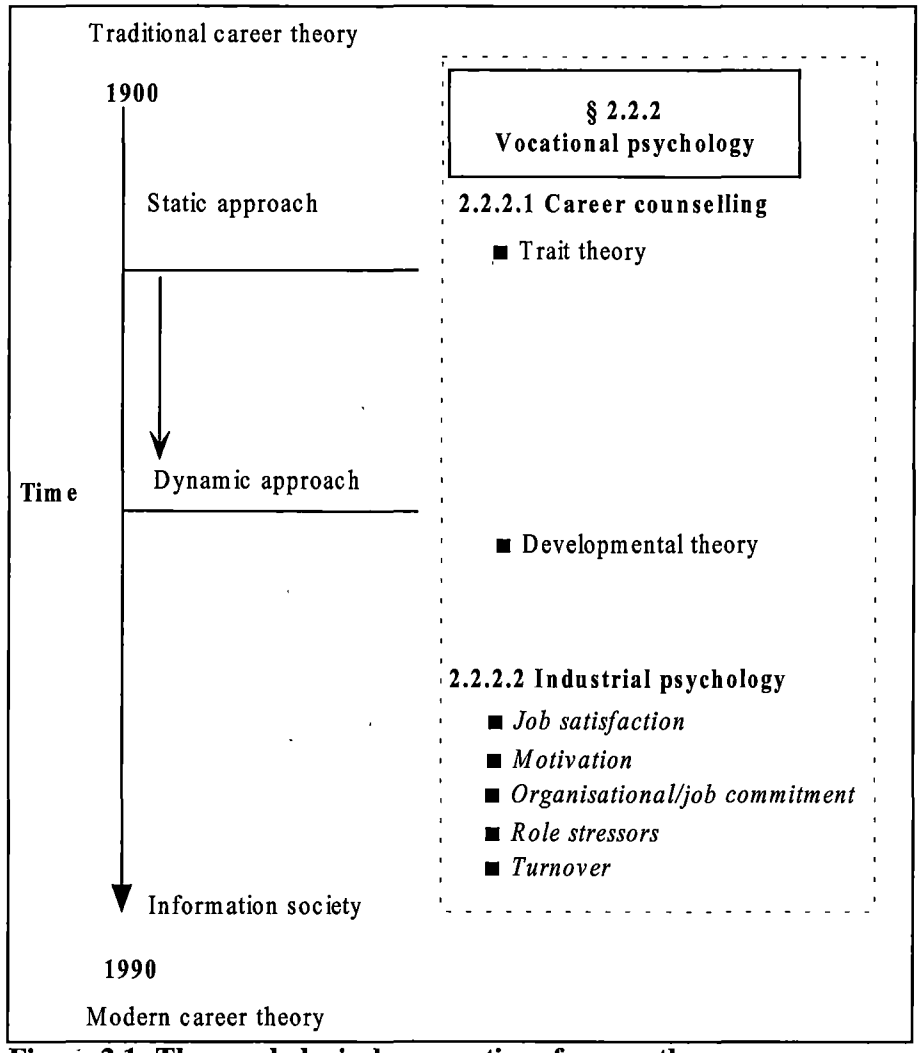


**Figure 2.1: The psychological perspective of career theory**

As Figure 2.1 shows, vocational psychology has been founded on two areas. Career counselling was the initial approach to careers from a psychological perspective. Later a second area, that of industrial psychology emerged.

### *2.2.2.1 Counselling psychology*

Over the last seventy-five years career counselling has been based broadly on two dominant models. In chronological order of evolution these have been developed specifically using two approaches: congruence and developmental models (Hackett, Lent & Greenhaus 1991). The first involves trait theory and the matching personal traits with the occupational environment. The second, developmental theory, views the progression of a career as either a series of stages or else as a continuous process (Dalton 1989). As the contextual background in Figure 2.1 highlights the advent of a developmental approach promoted a move from a static approach to a career to one that recognises the dynamic nature of a career. In the section to follow, each of these approaches will be briefly described and an example given from one of the eminent theorists in the area as identified from the literature. In addition, a short overview of commonly cited support and criticisms also emerging from the literature will also be provided.

*Congruence theory*

The basis of this theory was that individuals have personal characteristics that predispose them to a particular work environment. As a consequence, the main focus of this approach has been to identify individual characteristics and match these with specific working environments. Since both individual traits and environmental situations involved the same categories, it drew on the notion of congruence theory and was based on an assumption that the closer the match, the higher the probability of a successful occupational choice (Leibowitz & Schlossberg 1981). Non congruence was explained within cognitive dissonance theory (Festinger 1957) as capable of rationalisation. While one option is to change to a different occupation, according to this theory, when a person is faced with an incongruous situation they can also cognitively adjust to reconcile the dissonance.

Within congruent theories the work of Holland (Holland 1973) has been identified as not only the most frequently studied, but also the one most widely accepted by practitioners (Super 1981). Holland (Holland 1973); (Holland & Gottfredson 1981) defined six 'pure' personality types: realistic, investigative, social conventional, enterprising and artistic which were also seen as descriptive of occupational environments. This approach was founded on the premise that if one of these orientations emerged as a highly positive match between the organisation and individual, then this clearly indicated the optimal fit in the choice of career. For example, conventional types were said to be individuals who focussed on rules, self control, respect for power and structure (Sonnenfeld & Kotter 1982) and, consequently for this group, the ideal occupation was seen as being in clerical careers in either a banking or a commercial environment. If two or more types were equally represented, then the model predicted the match to be inconclusive with career choice seen as vacillating between potential careers. The closeness and clarity of the match between individual traits and work environment were central to determining an optimum career decision.

Holland's theory has been the most widely studied and practised vocational theory. It has also been described as exemplary in that it has been subjected to continual revisions and refinements to address substantive criticisms, while at the same time being simple and eminently practical (Hackett, Lent & Greenhaus 1991). The methodology involved two questionnaires that yielded self-assessable data based on self assessment (Hackett, Lent & Greenhaus 1991); (Super 1981). Further support for this approach was that it had an inherent appeal in a society where the concept of self actualisation had wide acceptance (Super 1981).

However, a major criticism to this approach was that it was limited to the initial stages of a career (Nicholson & West 1989) and as a consequence, founded on static associations between static personal traits and occupations (Sonnenfeld & Kotter 1982), while at the same time often assumptions were made of future stabilised performance (Nicholson & West 1989). Essentially, it ignored any dynamic interaction between employees and the work environment (Betz, Fitzgerald & Hill 1989). Additionally, it was regarded as atheoretical and untested, particularly with respect to longitudinal research (Super 1981); (Hackett, Lent & Greenhaus 1991). In particular, Nicholson and West (Nicholson & West 1989) expressed surprise that, despite claims to support that it had generated a considerable amount of career

research, there have been few attempts to extend the scope to post career entry job changes.

*Developmental theories*

The next stream of research during the 1940s to 1950s considered the process of stages in occupational choice and development. Within vocational psychology developmental theories were generally defined as coming from a life span approach.

> These theories generally highlight the content and/or process of career decision making, including issues of career entry and progression; they tend to focus on vocational outcomes from the perspective of the worker and to emphasise implications for vocational counselling (Hackett, Lent & Greenhaus 1991:4).

The work of Ginzberg, Ginzberg, Axelrod and Herma (Ginzberg *et al.* 1951) was notable, because not only did it mark the start of looking at the process of a career from a dynamic perspective, but also it was based on collaborative research effort involving an interdisciplinary team comprising an economist, a psychiatrist, a sociologist and a psychologist (Sonnenfeld & Kotter 1982). This research was based on the premise that vocational development could be classified according to four age determined stages. These began with a development stage up to the age of 10 years (fantasy), which then moved to a tentative stage (between the ages of 11-18), followed by a stage of reality (said to occur from age 19 to 25). The major finding was that vocational choice was identified as being based on an irreversible process that influenced by an individual's sense of reality, values, education and emotional factors. However, the work has been generally dismissed in the literature because of a serious limitation in that it failed to consider a more long term view of a career (Hackett, Lent & Greenhaus 1991).

Super (Super 1981); (Super 1984) has come to be regarded as a leading theorist in the area of career development. While his work also focussed on development according to age stages, it extended to cover the entire life span and also took into account how the concept of self changed over a life time. It was based on five life stages during which self concepts were:

- developed;
- tested;
- consolidated;
- maintained;
- wound down.

What each stage encompassed is summarised shown in Table 2.1.

**Table 2.1: The five stages of career development**
(after Super (Super 1981))

| Stage | | Focus |
|---|---|---|
| 1. growth | up to 14 years | development of self concept |
| 2. exploration | 15 - 25 years | concept of self tested against reality |
| 3. establishment | 26 - 45 years | consolidation of self concepts |
| 4. maintenance | 46 - retirement | stability of self concepts |
| 5. decline | retirement to death | winding down |

From the literature a number of positive features emerged from the work of Super (Super 1981). In particular, it has been seen as providing a systematic means of examining the components of vocational development and so had considerable utility and was demonstrated to be supported empirically (Hackett, Lent & Greenhaus 1991). It has been seen to have profoundly influenced vocational terminology ( for example vocational identity, career maturity, developmental tasks and career patterns) and also to have stimulated a considerable amount of empirical career research, especially in relation to career stages (Hackett, Lent & Greenhaus 1991). A major problem with life span models however, was that because of their broad framework, a great diversity of empirical findings and points of view could be accommodated (Dalton 1989). As a consequence, the extent to which Super's model has been tested is open to speculation as a considerable amount of the research his work stimulated has been on an ad hoc basis (Hackett, Lent & Greenhaus 1991).

A further criticism was the lack of attention to social and economic detail (Hackett, Lent & Greenhaus 1991), in particular, how issues of non work influenced occupational development, relevant biological data and the fact that the individual was regarded as rather passive: so called limiting static assumptions (Sonnenfeld & Kotter 1982). More generally, life span models of careers have been censured because their relevance was limited to male employees who entered the work force early and remained in a continuous career until retirement (Dalton 1989).

#### *2.2.2.2 Industrial psychology*

As stated earlier, vocational psychology involves two areas of career focus. The issues encompassed in the first, counselling psychology, have been briefly described in the preceding section. It is now proposed to follow this through to look at the second component of vocational psychology, industrial psychology, which is a field within organisational behaviour theory.

Table 2.2 provides a summary of the four major models of career research applied in the field of industrial psychology over a twenty year period. It also shows the main issues addressed within these models. The summary is based on the work of Hackett, Lent and Greenhaus (Hackett, Lent & Greenhaus 1991) and Staw (Staw 1984). Within these the issue of job satisfaction has been by far the most heavily researched topic (Staw 1984); (Katz & Maanen 1977), while individual performance has been considered the primary dependent variable. Staw (Staw 1984) also suggested job stress, dissent, whistle blowing, creativity and innovation as emerging dependent variables.

**Table 2.2: Models and issues within industrial psychology career research**
(after Hackett, Lent and Greenhaus (Hackett, Lent & Greenhaus 1991) and Staw (Staw 1984))

| Model | Issues |
|---|---|
| cognitive | job satisfaction, motivation, performance, performance feedback, appraisal, absenteeism, turnover and leadership issues |
| cultural diversity | minority groups, eg: gender, race |
| multiple role | roles an individual simultaneously occupies with the occupational role, ie father, team member |
| developmental | developmental issues as with counselling psychology but from an Organisational Behavioural perspective |

To this point in the review, the focus has moved from a broader view of career theory to consider the major underlying approaches within vocational psychology. Essentially, two distinct aspects are involved. The firstly, career counselling, has a focus on the individual and either trait or developmental theories are dominant. The second stream of vocational theory is taken from the micro perspective of organisational behaviour and here the interest in a career is management directed. That is, the role of industrial psychology is to consider issues that provide feed back primarily of interest to employers. The examples given in this section are not necessarily mutually exclusive and include job satisfaction, motivation, commitment, roles stressors and turnover.

### 2.2.3 Sociological career theory

Earlier in this chapter, career theory was identified as not only being responsible for the foundation of sociology as a scientific discipline, but also for establishing what has proved to be one of the dominant streams of career research. Broadly, the sociological study of careers has been based on two aspects of work mobility that, over time, have represented a move from a static to a dynamic approach. These are discussed further in the sections that follow. The first is that of an intergenerational approach, while the second involves an intragenerational viewpoint.

Repeating the approach adopted earlier when introducing vocational psychology, Figure 2.2 provides a graphical summary to describe a sociological perspective of careers. Basically, this shows the move from an initially static, intergenerational approach to one based on an intragenerational, dynamic approach which again is set in the context of the development over time, of broader career theory.

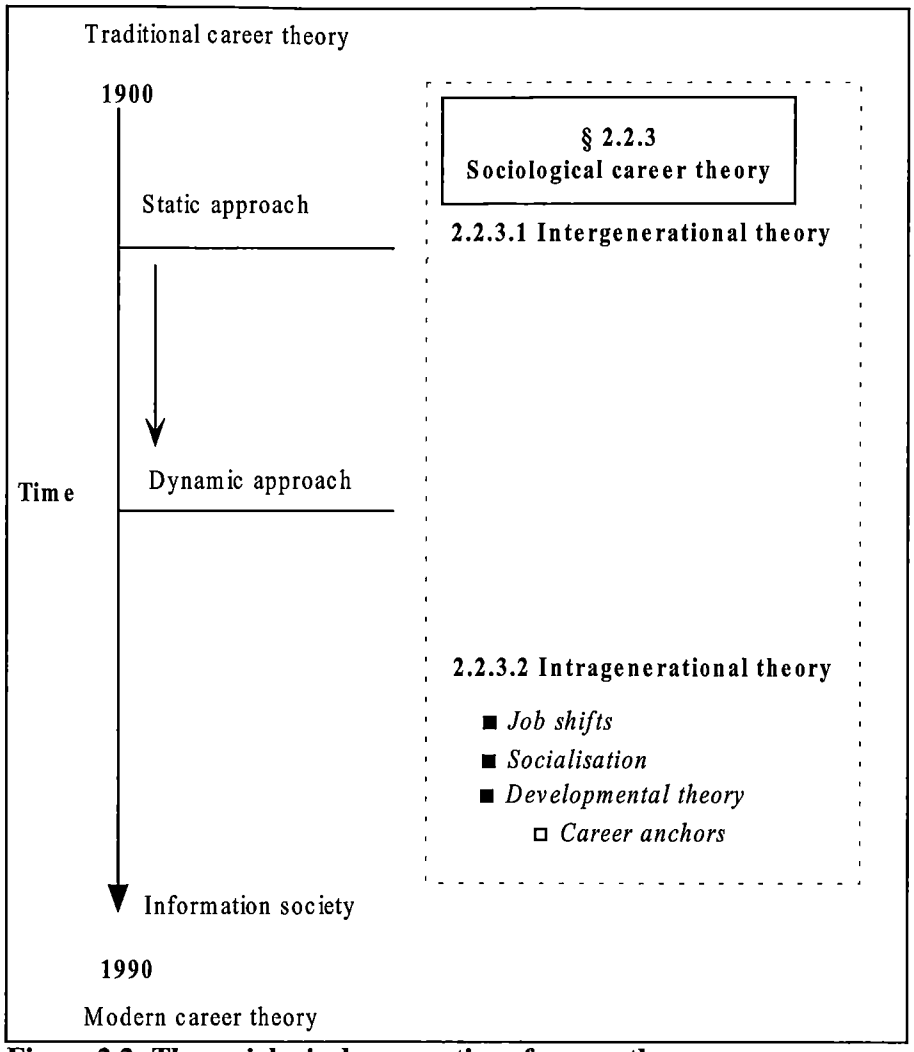


**Figure 2.2: The sociological perspective of career theory**

### *2.2.3.1 The intergenerational approach*

Social class determinants were central to the initial approach to careers within intergenerational sociological theory. The major focus of this approach was on career mobility and the effect of social inequality across generations (Rosenfeld 1992 ); (Sonnenfeld & Kotter 1982); (Super 1981). The objective of much of this research was to demonstrate that the status of a father's occupation was influential in determining the career choice of their male children. This early stream has been subsequently criticised because it is seen as a static approach and often ignored both the timing of career development and also the underlying nature of positional change (Rosenfeld 1992). It also needs to be pointed out in the earliest phases of this research women were not viewed as having careers in a commercial environment. This reflects the inevitable social bias earlier in this century when the careers of women, if in fact they existed, were regarded as either trivial or unfair competition to the male and family 'bread winner'.

### *2.2.3.2 The intragenerational approach*

In sociological career theory, the research focus has expanded, over time, to examine intragenerational mobility over the life course of an individual and to relate this to market structures. The major benefit of this changed approach was a greater consideration of both the career development of individuals and also the nature and

effects of the structure of career opportunities (Rosenfeld 1992). To this end, one of the primary streams of research focus has been on job shifts. This has involved examining employment mobility from a number of perspectives, which have mainly been centred on the structure of organisations and the career opportunities they offer. This approach was based on an assumption that while career patterns appeared random in some job histories, in others it was possible to identify normative patterns.

*Job shifts*

The job shift approach focussed on opportunity structures and was based on vacancy driven models, labour market segmentation or the effect of time during the course of a career (Rosenfeld 1992). Vacancy driven models included viewing job shifts by applying a vacancy chain approach, labour demand models or competition models. The measurement of vacancy chains provided the means of determining where the greatest opportunity lay within the strata of a given occupation. Labour demand models expanded the concept by looking beyond the creation of vacancies to consider the distribution and source of vacancies. The competition model considered how vacancies were filled and here the concept of a tournament as proposed by (Rosenbaum 1979b) has been influential. This was based on an analogy of a sports tournament where the victor proceeds to a higher level round working towards the trophy, and the loser needed to recontest at the existing level to again complete for upward career mobility.

Job shift opportunities could also be the result of labour market segmentation which, from a sociological perspective implied internal, occupational and national market forces. Internal described the structure of opportunity within an organisation which could also be applicable from an external perspective in the wider occupational market. National occupational markets could also be a source of job shift opportunities. Career processes could also be influenced by time and, based on the length of experience in the labour force, the extent of tenure within an organisation, or simply how chronological age effected job shift opportunities (Rosenfeld 1992).

*Socialisation*

A further emerging career research focus from a sociological perspective has been that of socialisation and how it contributed to occupational experiences (Super 1981). Socialisation is defined as the process whereby during childhood an individual establishes norms and values, determined through the influences of the culture of the society and the family of birth. These are then adjusted as individual life experiences are widened to involve contacts with the education system, peers and later the occupational function (Haralambos 1986). Schein (Schein 1981) conceptualised socialisation within a career as involving a two way process, firstly how the organisation influenced the individual and secondly how, in turn, the individual influenced the organisation.

Simply described, a person acquires an enduring self image based on their socialisation during childhood. Throughout life, even though the fundamental norms and values persist, people are confronted with new situations that often require adjustment to accommodate an increasingly wide range of environments and, as a consequence, a repertoire of experiences is accumulated. At the same time, personal characteristics can govern how an individual copes with this series of social adjustments. When organisational boundaries are crossed or entered, individual

differences can impact on outcomes. That is, coping strategies differ based on the types of criteria people apply, and how they analyse them. Broadly, a major assumption was that the greater involvement and higher the rank of a person in an organisation, the closer the alignment between its values and norms and those of that individual.

Schein (Schein 1981) explained the process of socialisation using a three dimensional model of an organisation (see Figure 2.3). This conveyed the extent of the potential boundaries that needed to be crossed within the course of a career, and how, these require adjustment to an individual's interpretation of social self. For example, movement could be either vertical, radial or circumferential. Vertical movement describes how a person can experience a series of upward or downward levels or rankings. At the same time radial movement defined change from the outside towards entry to the inner sanctum at specific levels. This implied the extent to which an individual could gain increasing access to 'company secrets' and, depending on their rank, the greater their input in power and decision making. The circumferential dimension described the number of departments on which the organisation was structured, and how, during the course of a career a person could move between these various functions.

Within this model, boundaries could vary in number, degree of permeability and type of filtering properties in a specific organisational structure. For example, organisations could differ in the number of departments and levels making up their structures. Consequently career options from an OB perspective were determined by the structure and size of the employer organisation. Further, movement depended on the extent of the rigidity or flexibility of the policy for crossing structural boundaries. Change could also be limited according to either formal or informal filtering. While these could be clearly established criteria for entry to higher or inner levels, on the other hand, the rules could be based on the norms informally applied within the group to be accessed. This introduces the notion of organisational culture which is largely determined by the political influences within an organisation.

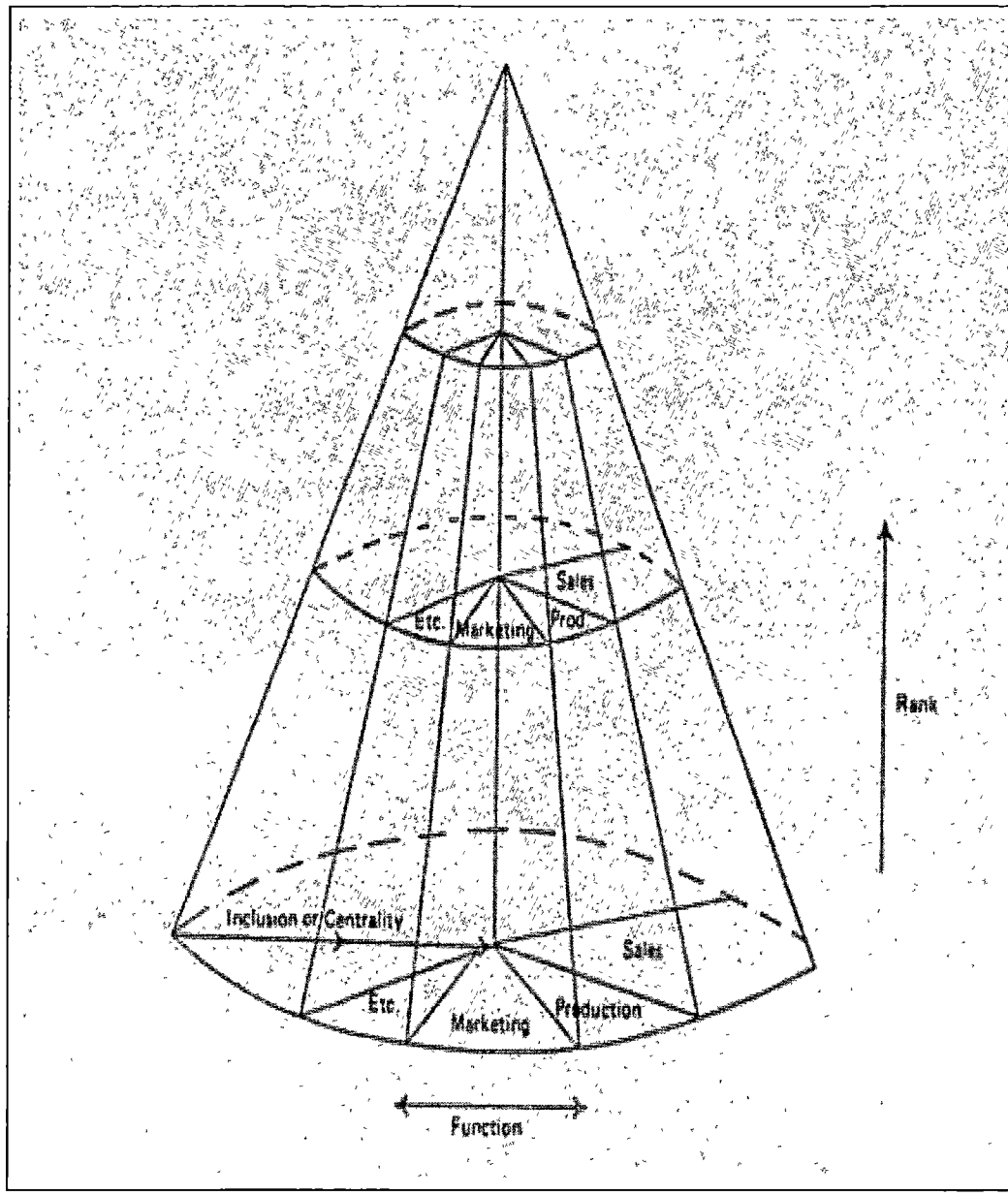


**Figure 2.3: A model of organisational career development after Schein**
(Schein 1981)

The role of socialisation in the career process is not without criticism. Bell and Staw (Bell & Staw 1989) refuted that people could be construed as malleable receivers of influence while the organisation was dominant. They questioned whether organisations were, in fact, powerful enough to homogenise behaviour in the face of individual differences. The human resources in any organisation are typically a heterogeneous group of people who differ in their ages, their backgrounds and their career specialities (Leibowitz & Schlossberg 1981).

*Developmental models*

Developmental models have also been applied in the sociological approach to career research however, in this stream the focus of research was on social adjustment either through the application of life span models or individual differences (Dalton 1989).

Miller and Form (Miller & Form 1951) proposed a developmental model from this perspective, and defined five stages which covered the entire life span. Namely:

- preparation;
- initiation;
- trial;
- stability;
- retirement.

Preparation covered the period of initial socialisation in the home and school. The social network was expanded on entry to part time work and further extended during full time employment into the third, trial period. The fourth and fifth stages, like Super (Super 1981) within counselling psychology, also related to stability and retirement, however this time the focus was from a sociological perspective.

This early model has been largely discounted, as it was seen to be largely played out before the career begins and so has been described as being based on an accident of birth (Dalton 1989). That is, while intelligence was included as an influential factor in a career, the substantial determinants were based on father's occupation, income, accessible financial aid and influential contacts.

Another developmental model was that of Dalton (Dalton 1989). This approach was based on the premise that the careers of some, but not all, professionals in organisations, moved through four distinct stages. What these encompassed is summarised in Table 2.3.

**Table 2.3: Stages in the Dalton developmental model**
(after Dalton (Dalton 1989))

| Stage | Focus |
|---|---|
| 1 | new employees work under the direction of more senior professionals and during this period the focus is on the assignment. This is considered an important time in a career for it is through early achievement that the new entrant has an opportunity to demonstrate capabilities that will influence future career movement. |
| 2 | after passing through the initial stage, a professional is given responsibility leading to the development of credibility and the establishment of a professional reputation |
| 3 | the focus is widened and at the same time the person often assumes the role of mentor for newly appointed professionals. |
| 4 | the professional is seen as capable of offering considerable direction for the organisation and often takes on the role of sponsor for those showing promise involved in the first two earlier stages. |

*Career anchors*

In relating individual differences to a developmental model of careers, the work of Schein (Schein 1978) was a considerable deviation against the conventional approaches applied in vocational career research (Dalton 1989). That is, rather than examining and linking individual characteristics with specific organisational environments, Schein adopted a converse approach by firstly developing an organisational model, and then looking at the intersect between organisational requirements and individual needs (Dalton 1989). The results from a longitudinal sampling of 44 MBA graduates showed that while there was little consistency in job

histories, there was, however, considerable similarity in the reasons underlying the career decisions of this group. Further, over a period of time, these became more clearly differentiated (Schein 1978).

Schein defined career anchors as:

> the pattern of self-perceived talents, motives and values which serve to guide, constrain, stabilise and integrate the person's career (Schein 1978:127).

The career anchors from the results of the research with these MBA graduates were found to be oriented to the following areas:

- technical;
- managerial;
- security;
- creativity;
- autonomy.

Technical described those whose main interest in careers was based in the pursuit of functional competence. The second anchor, managerial, referred to people who sought large amounts of responsibility and also the opportunity to associate the achievement of the organisation with their own efforts. A further group were found to be security oriented, meaning a stable career within a single organisation or geographic location. Creative careers Schein (Schein 1978) associated with entrepreneurial careers. Finally, individuals who increasing found little satisfaction working in large organisations were seen as adopting a career strategy based on autonomic, and independent, careers.

Career anchors were seen as emerging as a consequence of occupational experience during which people developed a self concept that accommodated individual abilities, motives and values. What was central to this concept was that these only develop on the basis of exposure over time to the working environment (DeLong 1982) and were manifested from the very beginning of the career, making the first three to five years of a career a persistent and highly significant determinant of future career decisions and outcomes. Delong (DeLong 1982) described the career anchor model as potentially a useful source of information for people planning career change and also for organisations wishing to guide career planning.

In this section the sociological, and second dominant approach within career theory, as outlined in Figure 2.2, has been examined. As with vocational career theory, this perspective is also divided between two streams. Within sociological career theory, this is based on an earlier intergenerational theory and, within the macro perspective of organisational behaviour research, intragenerational theory. These two approaches are also marked by a move away from a static to dynamic view of a career. The fundamental premise underlying the intergenerational approach was that the socio-economic standing of the family of birth largely determined the career across generations. Intragenerational theory, on the other hand, moved to a management perspective and involved job shifts, the role of socialisation and also involved a sociological developmental approach to careers.

### 2.2.4 Careers from an Human Resource Management perspective

Within organisational behaviour theory, a further related perspective of career research that represents an essential component in organisations, is that of human resource management (HRM). While career management was previously the domain of schools and academic institutions (Brooks 1984), organisational involvement has been stimulated by four objectives. These were to:

- increase worker productivity in times of slow economic growth;
- prevent burnout and obsolescence among employees who were focussed in technical roles;
- improve the quality of working life;
- adhere to affirmative action guidelines (Leibowitz & Schlossberg 1981).

Broadly HRM is defined as:

> a system that attracts, develops, motivates, and retains employees who ensure the effective functioning and survival of the organisation and its members (Jackson 1995:238).

In essence, the main focus of HRM is the creation and maintenance of the human resources of an organisation.

> The concept of the career has never been more popular. Once viewed mainly as a synonym for initial job choice, it is now widely accepted as a central feature in employment arrangements. Career development and human resource management programs are not only widely accepted but also seen as critical to both individuals and organisations (Arthur, Hall & Lawrence 1989:7).

HRM encompasses specific and formal human resource practices, and overarching philosophies (Jackson 1995) as such it implies a potential framework to work towards a combined approach to career research. It is regarded as an umbrella term that encompasses theoretical aspects based in sociology, economics, management and psychology (Jackson 1995); (Sonnenfeld 1989).

Accordingly, the inclusion of this approach in a review of career theory is appropriate as it provides both an opportunity to compare how the issues between the macro and micro perspectives relate, and how these are applied within organisations. However, because external contextual factors are also involved, the scope of potential issues and complexity are even further extended. However, beyond acknowledging the existence of these factors, it is outside the defined scope of this thesis to pursue them in any further detail.

The fundamental distinction that differentiates approaches to HRM is between the public and the private sector organisations (McGregor 1991). In addition, the decisions underlying the HRM policies in an organisation are determined by both internal and external characteristics. Some of the potential influences involved are shown in Table 2.4. These have been drawn from the work of Jackson and Schuler (Jackson & Schuler 1985) and Sonnenfeld (Sonnenfeld 1989).

**Table 2.4: The career factors within an HRM perspective**
(after (Jackson 1995); (Sonnenfeld 1989))

| 1. Internal factors | 2. External factors |
|---|---|
| **Organisational types** | **Environment** |
| • *technology* | • *legal* |
| • *size* | • *social* |
| • *structure* | • *political* |
| • *life cycle stages* | Unionisation |
| • *business strategy* | National culture |
| **Career assignment flow** | Industry |
| • *institutional economics* | Labour market conditions |
| • *transaction costs* | |
| • *internal labour market* | |
| • *human relations theory* | |

Consequently, it is evident from the HRM perspective that:

> a career does not exist in a social vacuum but is in many ways directed by the employer's staffing priorities (Sonnenfeld 1989:202).

The following two sub-sections consider the remaining major perspectives of the macro perspective of career theory, those based in economics and political science. Figure 2.4 shows these additional macro perspectives in a context of the broader career theory and locates them under the umbrella of human resource management.

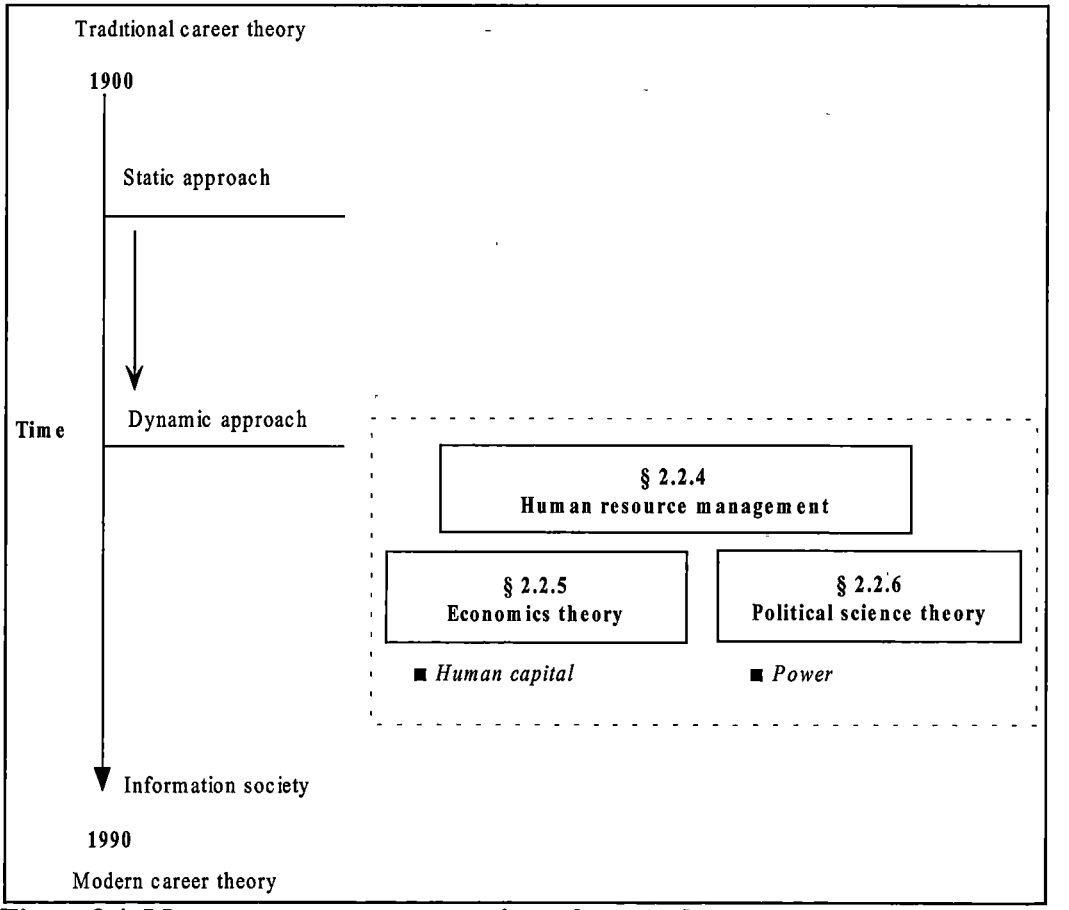


**Figure 2.4: More recent macro perspectives of career theory**

### 2.2.5 Career theory from an economics perspective

> Careers have been a major focus of research in microeconomics. Yet, the implications of this work for how individuals should manage their own careers remain obscure (Barney & Lawrence 1989:433).

From an economics perspective of career theory, the main focus has been at a macroeconomic level with an interest in the structure and functioning of the labour markets, rather than the individual career experiences of those involved in them (Barney & Lawrence 1989). Labour is defined as the key factor of production, so the emphasis was on the cost and output from its use. From the perspective of the individual, the relevance of this approach was that it was more focussed on career strategies, in particular job search, the employment relation, human capital and market signalling and implicit contracts (Barney & Lawrence 1989).

Human capital can be described as being represented from two perspectives. The first is the organisational perspective, where the cost of eliciting productive behaviour in employees - including motivating, monitoring and retaining their services was also made on an expectation of future returns. The second is based on the individual, where the aim was a process of optimisation (Sicherman & Galor 1990). That is, based on investment in schooling and abilities, a person chooses a feasible career path to maximise their return through lifetime earnings.

Consequently, economics career theory has largely been focussed on mobility and the career planning decisions of employees, which encompassed issues such as investment in human capital, variations in wage profiles and interfirm mobility (Sicherman & Galor 1990).

### 2.2.6 Career theory from a political perspective

> A political approach to careers recognises, first, the fundamental primacy of interests. It thus becomes one of the tasks to research adopting such a perspective to identify the dimensions along which political cleavages occur, and indeed, to explore and explain why these have become important dimensions.....Second, a political perspective on careers would then seek to explore how interests, and their relative power, structure opportunity, wage relationships and, succession in organisations (Pfeffer 1989:392).

This perspective of career research focuses on the role of power and the interplay of interests within an organisation. It can also prove to be very complex as the establishment and maintenance of dominance extends across a number of areas:

- the broadest organisational level;
- alignment with the primary focus group;
- across and between departmental boundaries;
- group alliances;
- individual worker.

The political effects in a career begin with the hiring standards, selection, mobility and wages through to the policies of succession (Pfeffer 1989). In particular, in the context of this current study, the influence of power is of special significance during the hiring and selection process. As will be explained later in relation to the initial post graduation appointment, the notion of homosocial reproduction implies the outcome will be largely driven by the politics of the dominant group in the organisation. Consequently, the political approach to career theory provides a further, and potentially highly influential perspective in relation to a career.

The notion of the political forces in an organisation are closely linked to the consideration of organisational culture. While this supports the importance of this aspect of a career, it also highlights the complexity of issues involved, which are well beyond further consideration in the scope of this research.

To this point in this chapter the traditional approaches underlying career theory have been considered. In the next section, the focus moves to signal the implications of the information age for a change in the nature of a career in the modern business environment.

### 2.2.7 A modern, emerging perspective of career theory - the protean career

The objective of this section is to consider career theory in light of the changing modern business environment and to examine how this impacts on the notion of a career in the traditional sense. While in the previous section the fragmented nature of career theory has been demonstrated, the advent of the ' Information Age' means that the nature of the problem is now changing.

> Information technology has forever changed the nature of work by creating the seemingly endless potential to acquire, manipulate, and apply information (Smits, McLean & Tanner 1997:36).

As a consequence many of the traditional career issues are increasingly becoming obsolete and new issues are emerging as important aspects in a career. From the mid 1980s technological advancements have significantly altered the nature of organisations and, in turn, the working environment for employees. Essentially, the major driving force behind this change has been the rapid advancement of computers and communications technology. In Chapter One, the concept of the 'Information Age' was introduced to establish a topical context for the research proposed in this thesis. The primary aim was to support the particular orientation of this research to IS careers. This section introduces modern career theory and is seen as further reinforcing the appropriateness of the research presented in this dissertation.

> The traditional psychological contract in which an employee entered a firm, worked hard, performed well, was loyal and committed, and thus received ever-greater rewards and job security, has been replaced by a new contract based on continuous learning and identity change.....In short, the organisational career is dead, while the protean career is alive and flourishing (Hall 1996:8).

Organisations in the post industrial society are characterised by more and increasing knowledge, complexity and turbulence which, in combination, poses a qualitatively more demanding organisational environment (Huber 1984).

> Businesses, especially large ones, have little choice but to become information based. Demographics, for one demands the shift. The centre of gravity in employment is moving fast from manual and clerical workers to knowledge workers who resist the command and control model that business took from the military 100 years ago. Economics also dictates change, especially the need for large businesses to innovate and to be entrepreneurs. But above all, information technology demands the shift (Drucker 1988:45).

Further, not only is the pace of change without precedent (Finkelstein & Newman 1984), but the linking of computers and telecommunications means businesses must now operate in a global, real time environment. The geographical and cultural differences that previously acted as time buffers are now greatly diminished (Huber 1984). As a consequence, the modern commercial environment is highly volatile (Worren & Koestner 1996) and to compete, let alone survive, organisations need to be innovative and capable of change to quickly adapt and respond to market conditions. Therefore, in the 1990s one the premier challenges for management was the design of more flexible organisations (Hirschhorn & Gilmore 1992). This has given rise to the self designing organisation, with the underlying issue being that of impermanence (Huber 1984); (Weick & Berlinger 1989) particularly in high technology organisations where it is a key characteristic (Finkelstein & Newman 1984). Haverman and Cohen (Haveman & Cohen 1994) identified the three dynamics driving modern organisations as foundings, dissolutions and mergers.

> ...in general, organisations have survival as a goal and, in general, organisations whose structures, processes and technologies are well suited to their environment have a greater likelihood of survival than do those whose structures and processes are poorly suited to their environment (Huber 1984:929).

The move to a more flexible environment is altering the structure of organisations. The traditional hierarchical pyramid is no long appropriate in an economic environment where the key to survival is the ability to quickly adjust to change (Saville & Sowerbutts 1990). Organisations are being forced into a flatter, leaner and more efficient structure. Within a ten year period the proportion of the labour force employed by Fortune '500' companies fell from 30% to 13% (Drucker 1988).

A significant example is that of IBM which for 50 years maintained an almost total reliance on its internal labour market (Sonnenfeld 1989), ensuring that after entry the career was linked to the organisation. In 1985 when 200 major firms announced massive layoffs and closings, IBM retained its work force through redeployment and retraining. However, this was a position it was ultimately unable to sustain (Drucker 1988); (Westerman & Donaghue 1989).

At the same time boundaries, now seen as making organisations rigid and unresponsive, are being eliminated (Hirschhorn & Gilmore 1992):

> In the traditional company, boundaries were 'hardwired' into the very structure of the organisation. The hierarchy of occupational titles made manifest differences in power and authority. Independent functional departments coordinated pools of specialised expertise. Dedicated business units were a reflection of a company's products and markets .....this traditional organisational map describes a world that no longer exists. New technologies, fast changing markets, and global competition are revolutionising business relationships (Hirschhorn & Gilmore 1992:105).

As organisations have moved to become information based, there is no longer a need for middle levels of management which previously served as a conduit between the lower and higher structures (Harris 1993). The elimination of this strata has removed the effect of gatekeeping that previously existed between the higher and lower orders in the organisation. Allred, Snow and Miles (Allred, Snow & Miles 1996) described organisational structures as moving from hierarchical, to that of a network and more recently being forced to take on a cellular form.

Because organisations have been forced to restructure, for the individual worker this is also bringing about change in the traditional concept of a career:

> ...if organisations are going to have to adapt to changes in the environment as rapidly as current trends seem to project, what are the processes that members of those organisations will use to form and reform themselves to perform these ever changing tasks? If organisations actually need the high commitment from individuals that managers and writers seem to think will prove necessary for organisations to compete in worldwide markets, how are those organisations going to have to change to allow the kind of individual development that will maintain that commitment ? (Dalton 1989:108).

Whereas previously HRM planning was based on a long range process, it now must be more tentative, short term and focussed (Schuler & Walker 1990), with roles adjusted in-line with corporate shifts and strategies (Worren & Koestner 1996). For employees this means that careers are increasingly becoming based on discontinuity, rather than stability (Bailyn 1989); (Hirschhorn & Gilmore 1992). Consequently, the traditional career, based on a long standing covenant between organisation and employee, is rapidly becoming a thing of the past (Waterman, Waterman & Collard 1994). In an environment where innovation is a crucial component, it is essential that organisations ensure highly permeable external boundaries (Schein 1981). To enable organisations to be flexible and capable of quickly adapting to new business opportunities, employees are treated as a means to an end (Weick & Berlinger 1989) which implies employees will be constantly renewed (Waterman, Waterman & Collard 1994).

In line with these changes, the relationship between organisation and employee is moving from one of a parent-child to one of adult-adult (Waterman, Waterman & Collard 1994). Unlike the situation in the traditional organisation, in the emerging organisation there needs to be mutual understanding and responsibility (Harris 1993). This implies that the onus of responsibility in a career must fall on the individual giving rise to the concept of a modern career as one being based on career resilience (London 1993); (Waterman, Waterman & Collard 1994); (Harris 1993). In particular, this introduces the notion of the modern career which, in order to adjust to the uncertainties in the changed commercial environment, must be based on a protean approach (Hall 1996). The Concise Oxford Dictionary (Sykes 1976) defines this term as having multiform capabilities and is derived from Greek mythology where Proteus, a sea god, is fabled for being capable of taking a variety of shapes.

Consequently, new career competencies that are becoming increasingly essential involve metaskills such as adaptability, tolerance for ambiguity and uncertainty, and identity change (Weick & Berlinger 1989). Employees of today must accept greater responsibility in the management of their own careers. They must also now regularly self assess and factor in potential influences of their personal patterns (implying a

unique set of attitudes and behaviours) in their career decisions (Waterman, Waterman & Collard 1994); (Brousseau *et al.* 1996). At the same time, they must also be capable of adapting to new positions and organisations (London 1993).

### 2.2.8 Career theory - an overview

The aim of this section has been to draw together the main approaches underlying the notion of career theory. Figure 2.5 provides a graphical overview of these various perspectives. This figure establishes a time line to describe the aspects of the evolution of career theory, namely the:

- emergence of the information age;
- move from static theories of careers to one that acknowledges the dynamic nature of a career;
- dominance of psychological and sociological approaches in career theory;
- move from traditional career theory to modern career theory and the notion of the protean career.

The figure also introduces organisational behaviour to illustrate that, within career theory, industrial psychology is differentiated as representing a microperspective of organisational behaviour theory. The macro perspective is made up of three streams of career research: sociological intragenerational theory, economics career theory and political science career theory (Staw 1984).

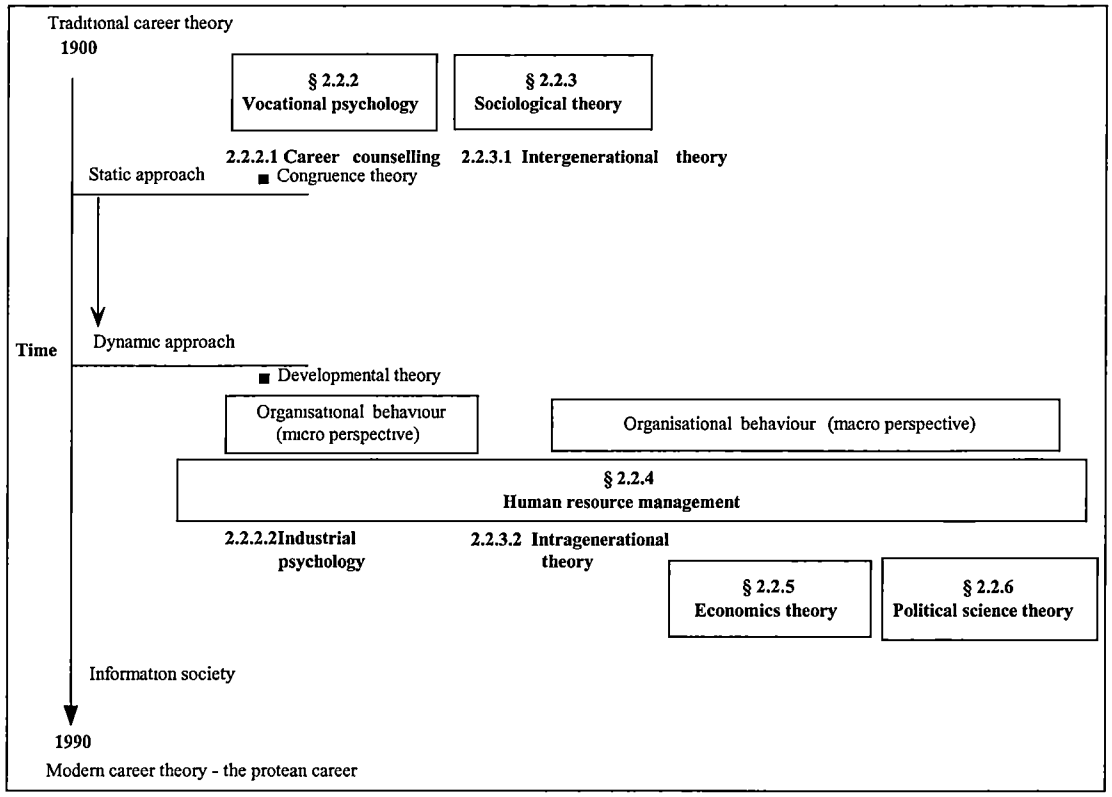


**Figure 2.5: A graphical overview of career theory**

## 2.3 The application of career theory in the context of the present research

The examination of the concept of traditional career theory has served to highlight the fundamental factors that contribute to an understanding of human work life. A major beneficial outcome from this process is that it has established a guide to relate the present research with respect to the broader theoretical foundations of career theory.

In particular, the review has clearly demonstrated that there is no single career theory that can be applied *per se* in career research. It has also provided evidence to discount a number of the perspectives implied in the broader career theory as inappropriate bases for the research proposed in this thesis. In particular:

- the issues and approaches implied in trait (congruence) and intergenerational theories support their immediate rejection. In particular, both are based on a static approach. The matching of individual traits and an organisational environment ignores that change, on both parts, is also a feature of the work relationship. Intergenerational theories largely had their roots in the pre-industrial society when crafts were handed down in cottage industries. With the emergence of the industrial society many new career areas have been created while many traditional ones have disappeared;

- from a career counselling perspective, while developmental career theories follow a career over the life course, of necessity the present

research will be based on a retrospective approach. The primary focus of this stream of developmental career theory, self concepts, is also outside the scope of the stated objectives for this current study;

- the aspects making up the intragenerational stream of career research within sociology are dismissed as unsuitable bases for the present study, as:
  - job shifts imply an emphasis on the influence of labour market forces;

  - socialisation, while an important issue in career development, can only be applied when prospective data are involved. That is, the aim in this approach is to trace employment experiences encompassing up to the first five years of a career, making the initial experiences of primary concern;

  - the notion of a career in a single organisation is implicit in the organisational career development cone from Schein (Schein 1981) which limits the application of its approach to research within that context.

- the early roots in social class determinants continued to influence the first stream of developmental models in sociology, which also eliminates this approach. The second stream of developmental theory after Dalton (Dalton 1989), based on the premise of progressive stages in a professional career, also implies prospective data. However, in relation to the initial stage in a career, this approach has some potential to guide the research currently being addressed;

- career anchors necessitate prospective data from both an individual and organisational perspective. Consequently, this approach is outside the scope of the present study.

## 2.4 Career research

With the fundamentals of career theory now established, the objective in this section is to gain an insight into general, non-IS career research. This review represents a second stage in the process to gain some knowledge and understanding of career research in the area and, in turn, develop a substantive foundation for the present research with its primary focus on IS careers.

Two aspects of career research will be presented, on the premise that these constructively contribute to the objective of expanding an understanding of career research. These perspectives are namely:

- areas of career research from an organisational behavioural perspective largely based in industrial psychology;

- examples of more comprehensive research in a career field closely allied with IS, librarianship.

### 2.4.1 Organisational behaviour career research

In this section, examples of career research based in this perspective of traditional career theory will be examined, to demonstrate both the issues addressed and the various approaches applied. What has become evident from the literature is that a considerable body of career research is based on a management perspective. In other words, studies have mainly been conducted to provide feedback to employers to guide policy and decision making in organisations. The particular topics have been selected with reference to Staw (Staw 1984) and are:

- job satisfaction;
- role stressors;
- turnover;
- commitment.

#### *2.4.1.1 Job satisfaction*

From an organisational behavioural (OB) perspective, job satisfaction has been the primary focus of career research (Staw 1984) and has been widely studied since the 1940s (Quarstein, McAfee & Glassman 1992).

> Job satisfaction is an indication of how individuals feel about their job when their expectations are compared to what is actually received from different facets of the work situation (Quarstein, McAfee & Glassman 1992:860).

The following examples of research into job satisfaction have been selected to convey a range of approaches that have been applied. These include the work of Katz and Van Maanen (Katz & Van Maanen 1977); Quarstein, McAfee and Glassman (Quarstein, McAfee & Glassman 1992); Agho, Mueller and Price (Agho, Mueller & Price 1993) and Moorman (Moorman 1993).

*The loci of satisfaction*

The research of Katz and Van Maanen (Katz & Van Maanen 1977) was motivated by a perception that despite the high volume of research focussing on job satisfaction, problems of ambiguity, conflicting opinion and methodological nuances still persisted. The study involved interviewing three and a half thousand people working in the public sector to investigate the nature of job satisfaction. The results showed that designing parameters that described job satisfaction was highly complex, encompassing job properties, the interaction context and organisational policies.

*Situational occurrences*

Quarstein, McAfee and Glassman (Quarstein, McAfee & Glassman 1992) saw job satisfaction as being influenced by two factors, described as situational characteristics and situational occurrences. The former had its basis in pre job evaluations while the latter resulted from on the job experiences. Basically, these distinguish between prior impressions of an appointment based on the facets promoted during the recruitment process (pay, opportunities for promotion and work conditions etc.) and issues not mentioned at that time but later arose in the course of employment (forgetful supervisors, inadequate or inappropriate work environments, lack of recognition etc.).The research involved a two stage methodology. In Stage One, open questions were presented to a sample of fifty, full time and part time students who had, on average, 3 years work experience. Stage Two was based on a

questionnaire administered to an independent sample of 171 students. The results supported the projected theory of situational occurrences, in particular, the ability to explain low job satisfaction when engaged in a traditionally good situation in terms of salary, promotion opportunities and co-workers. Consequently, this work was viewed as demonstrating a successful means of determining the reasons for different levels of job satisfaction for individuals, who seemingly sharing identical work conditions. This approach was also viewed by these researchers as beneficial in explaining the change over time in the level of job satisfaction, even though the work conditions remained stable.

*Employee satisfaction*

Agho, Mueller and Price (Agho, Mueller & Price 1993) revised the Price-Mueller turnover model to include environmental, job characteristic and personality variables. This model has been extensively applied and redeveloped in relation to the job satisfaction of health industry workers. The study involved a further revision and the new model was then incorporated into a questionnaire which was administered using a two stage, longitudinal approach. This study was seen by these researchers as making three important contributions to job satisfaction research:

- it demonstrated that to gain a better understanding three variables were essential inclusions: environment (opportunity), job characteristics (routinisation, distributive justice) and personality (positive affectivity, work motivation);
- the modified model applied in this study, unlike in the mixed results from previous research, accounted for 57% of variance in job satisfaction;
- by providing a greater insight into job satisfaction as an intervening variable in the model, its explanatory powers were enhanced. In particular, this research offered the ability to reliably link job satisfaction with turnover.

*The influences of cognitive and affective based measures*

Moorman (Moorman 1993) argued that traditional measures of job satisfaction did not necessarily provide evidence of the quality of performance. In this study, organisational citizenship behaviour was used to distinguish between affective job satisfaction and cognitive job satisfaction. Organisational citizenship behaviour was defined as the implicit actions of an employee while engaged in the work environment, as distinguished from conduct that attracted reward or recognition. The aim was to match employee responses with organisational citizenship behaviour data obtained from a survey of management. Differentiating these two views of job satisfaction was seen as crucial to determine between simply a 'good mood' effect and satisfaction, or that based on a logical and rational evaluation of job conditions. Data were collected from the managers and employees from two medium sized companies. The results supported the application of organisational citizenship behaviour as a means of revealing different outcomes for job satisfaction based on these two determinants.

### *2.4.1.2 Role stressors*

Within the general OB perspective, a considerable body of empirical research also exists into role ambiguity and role conflict. Some examples are studies reported by

Miles and Perreault (Miles & Perreault 1976); Van Sell, Brief and Schuler (Van Sell, Brief & Schuler 1981); Mossholder, Bedeian and Armenakis (Mossholder, Bedeian & Armenakis 1981) and Jackson and Schuler (Jackson & Schuler 1985).

From the literature role ambiguity and role conflict are generally said to be the major causes of role stress (Van Sell, Brief & Schuler 1981). There are, however also those that would argue against this view:

> The correlations of role ambiguity and role conflict with tension, and presumably other physiological reactions, seem to be the major reason that research on conflict and ambiguity is categorised as 'stress' research ..... But, to date there is far too little evidence to accept this conclusion as true (Jackson & Schuler 1985:40).

Role ambiguity has been defined as occurring when the expectations or desired outcomes of a particular appointment were unclear due to a lack of any formal guidelines as to what was required (Miles & Perreault 1976); (Guimaraes & Igbaria 1992); (Igbaria & Greenhaus 1991). Role conflict was explained as when two or more demands of a role were incompatible to an extent of being in direct opposition (Miles & Perreault 1976); (Guimaraes & Igbaria 1992); (Igbaria & Greenhaus 1991).

Boundary spanning is a secondary factor that can also be of influence in creating role stress. It has been defined as the extent to which an employee acts outside their core department (Igbaria & Greenhaus 1991), a situation that can prove highly influential in either the retention or loss of an employee. Boundary spanning can provide a greater variety in an appointment and subsequently increased job satisfaction (Baroudi 1985). It can also lead to role conflict, especially when a widened scope of role activity serves to heighten an awareness of opportunity.

*Antecedents and consequences*

Miles and Perreault (Miles & Perreault 1976) investigated the antecedents and consequences of organisational role conflict. This research was based on a model encompassing issues related to role requirements, role perceptions and individual outcomes. The issues each of these aspects involved are shown in Table 2.5. A questionnaire was administered to professional level personnel employed in nine government research and development organisations. The results, based on the comparison of five positional role groups, showed five distinct conflict oriented groups, which differed significantly in relation to work outcomes.

**Table 2.5: A summary of the scope of the model of role conflict antecedents and consequences**
(after Miles and Perreault (Miles & Perreault 1976))

| Objective role requirements | Role perceptions | Individual outcomes |
|---|---|---|
| importance of selected job activities | multivariate conflict orientations: | job related tension |
| integration and boundary spanning | • *person- role* | job satisfaction |
| personnel supervision | • *interasender conflict* | perceived performance effectiveness |
| scientific research and role set characteristics: | • *intrasender conflict* | role attitudes toward role senders |
| • *organisational distance and formal authority of role senders* | • *overload conflict* | |

*Integration of the literature and directions for future research*

Van Sell, Brief and Schuler (Van Sell, Brief & Schuler 1981) conducted an extensive review of role conflict and role ambiguity research. This work was seen as demonstrating the range, and considerable overlap, in the research topics addressed from an organisational behavioural career perspective. These authors concluded that while a great deal was known, there was still much to be learned. In their view, research on this topic was found to be only moderately consistent in focus, leading to the conclusion that future research in the area should adopt a contextual framework.

*Role perceptions, satisfaction*

Mossholder, Bedeian and Armenakis (Mossholder, Bedeian & Armenakis 1981) claimed a direct relationship between role ambiguity and role conflict had been confirmed in role research and there were moderating variables influencing this linkage. Their research examined the role of self esteem and organisation level, as moderators in the perceptions of role conflict and role ambiguity, with employee satisfaction and performance. The results, based on data collected from 161 hospital professionals and support personnel, confirmed their hypothesis that, high self esteem at lower organisational levels attenuated the negative effects of role ambiguity and conflict on satisfaction and performance. This outcome lead Mossholder, Bedeian and Armenakis (Mossholder, Bedeian & Armenakis 1981) to the conclusion that both situational and individual differences acted as buffers.

*A meta-analysis*

Jackson and Schuler (Jackson & Schuler 1985) also reviewed articles spanning a ten year period and identified approximately 200 empirical articles dedicated to the topic of role ambiguity and role stress. These authors demonstrated that, by comparison, role ambiguity was more often studied, and the strength of correlations between the two variables was often considerably different. In 96 articles analysed Jackson and Schuler (Jackson & Schuler 1985) found 29 correlates of role ambiguity and role conflict involving organisational context variables, individual characteristics, affective reactions and behavioural reactions. The issues these variables encompassed are summarised in Table 2.6:

**Table 2.6: A meta framework of role ambiguity and role stress factors**
(after Jackson and Schuler (Jackson & Schuler 1985))

| Organisation context | Individual characteristics | Affective reactions | Behavioural reactions |
|---|---|---|---|
| task/skill variety | locus of control | job satisfaction | absence |
| autonomy | tenure | general | performance |
| feedback from others | age | supervision | objective |
| feedback from task | education | work itself | others' ratings |
| task identity | self esteem | co-workers | self ratings |
| leader initiating structure | | pay | |
| leader consideration | | advancement | |
| participation | | tension/anxiety | |
| formalisation | | commitment | |
| level | | involvement | |
| | | propensity to leave | |

### *2.4.1.3 Turnover*

Employee turnover has been described as an important problem facing industrial and governmental organisations (Staw 1984). While some labour force mobility is to be expected and, indeed, is considered to be essential to promote new ideas, when turnover is excessive it can prove to be both disruptive and costly.

Examples of turnover research, include one from an economics perspective (Stromback 1988) and others from an OB perspective have been reported by Short and Martin (Shore & Martin 1989); Sicherman and Galor (Sicherman & Galor 1990) and Haverman and Cohen (Haveman & Cohen 1994).

*Job mobility in Australia*

From the economic perspective Stromback (Stromback 1988) argued that a considerable portion of labour market mobility arises from imperfect information. That is, new information could motivate an employee to seek to improve their work situation. At the same time, when an organisation becomes aware of decreases in productivity, workers could be laid off a job. The research of Stromback (Stromback 1988) analysed labour market data compiled by the Australian Bureau of Statistics from 1982 to 1986, which recorded employment mobility based on quits, lay-offs and fixed term and, since 1984, tenure of job. These were classified by occupations, which are divided into professional, administrative, clerical, sales, farming, transport and communications, trades and service.

The findings of this investigation supported the view that, from an employee perspective, information gathering, job searching and job reviewing were prominent reasons motivating mobility, and also that tenure was a strong determinant of turnover. When an employee was uncertain about the situation, then there was a motivation to change to a new work situation. Conversely, the longer the tenure, the more likely that an employee would remain. At the same time, the longer the standing of the appointment, the more likely that remuneration would reflect the value of work specific skills, and reinforced the decision to stay.

*Commitment, performance and turnover intentions*

Short and Martin (Shore & Martin 1989) hypothesised that:

- organisational commitment would be more closely related to turnover intentions than would job satisfaction;
- job satisfaction would be more closely related to job performance than would organisational commitment.

In this study the inclusion of job performance was seen as a positive feature, as these researchers could not find any evidence in the literature of it being applied in the context of organisational commitment. The research used a self-report mailed questionnaire which was administered to two samples. The first consisted of medical professionals and the second targetted bank clerks. The results showed that, for clerical workers, the intention to stay was more strongly linked to organisational commitment. While this outcome was also true for the professional group, it was to a much weaker extent. For both sample groups job satisfaction, rather than organisational commitment, was associated with supervisory ratings of performance. Finally, global organisational attitudes were identified as being more closely associated with organisation relations, in particular, turnover intentions.

*A theory of career mobility*

The work of Sicherman and Galor (Sicherman & Galor 1990) was based on data drawn from the Panel Study of Income Dynamics (PSID). This was an annual sampling of male heads of households aged 18-60 for the period 1971 to1981 which gathered data about employment status (employed or unemployed) and the title of the current or last position, a demographic profile (marital status, race, age and schooling) experience and tenure. This research was extended to the existing major areas of labour market phenomena (human capital, differences in wage profiles and interfirm mobility). It also included occupational mobility, defined as change in tasks performed on the job, which was seen to be an integral component of individual careers.

The results showed a link between a high level of education and a small number of occupations, to the less likelihood of occupational/firm mobility. In some occupations, promotion could involve movement across firms. Increasing tenure was found to be associated with decreased mobility. The optimal quitting time for workers who failed to achieve early promotion was shorter and more frequent than amongst those who did advance. These outcomes were consistent with the work of Rosenbaum and the notion of tournament mobility (Rosenbaum 1979b). This concept was explained earlier in this chapter as being based on the analogy of a series of rounds faced by competitors in a contest.

*The ecological dynamics of careers*

Haverman and Cohen (Haveman & Cohen 1994) provided a different perspective of mobility and examined the effect of the demographic metabolism (defined as industry dynamics, turnover and tenure distributions) of organisations. This research was based on the premise that explanations of organisational tenure were fundamental to explain job mobility. In other words, this research was focussed from the demand side and examined how the emergence of new companies, mergers and dissolutions effected mobility. Obviously, all three of these factors could have a major impact on the occupational environment by the creation, reduction or removal of employment opportunities. Data covering the work histories of 6,039 management

employees of the savings and loan industry in California were examined for the period from 1969 to 1988.

The results showed that, in particular, the creation of new organisations was influential promoting dispersion of tenures in established companies. While dissolutions were relatively few, these also effected managers to the extent that they moved out of the industry. For surviving firms the impact of mergers and acquisitions was shown to also be significant. While nearly half of those whose appointments were effected moved to a new area of employment, the remainder directly transferred to the acquiring organisation and, as a consequence, the entry rates for these increased substantially.

#### *2.4.1.4 Commitment*

Broadly, career research in this area generally relates to either organisational commitment or job/occupational commitment. This distinction is reasonable given that professionals are often described as having their primary loyalties to their profession rather than the employer organisation (Martin & Shell 1988). From a research perspective the majority of attention has been directed to organisational commitment (Vandenberg & Scarpello 1994). The scope of some examples of commitment research includes the work of Steers (Steers 1977); Weiner and Vardi (Wiener & Vardi 1980); Zeffane (Zeffane 1994); Jans (Jans 1985); Moorman and Blakey (Moorman & Blakely 1995); Bluedorn (Bluedorn 1982) and Cohen (Cohen 1991).

*Antecedents and outcomes of commitment*

Steers (Steers 1977) studied the antecedents and outcomes of organisational commitment, hypothesising that personal characteristics, job characteristics and work experiences were antecedents of organisational commitment. In turn, these factors were seen as influencing outcomes such as intent and desire to remain, attendance and job performance. Based on a cross validated sample of 382 hospital employees and 119 scientists and engineers, the results showed that all three factors influenced organisational commitment. Further, while commitment was strongly associated with attendance for the professional groups, this result was not true for the hospital workers.

*Relationships between commitments and work outcomes*

Weiner and Vardi (Wiener & Vardi 1980) applied an integrated approach using job, organisation and career commitment to study the career outcomes for two diverse occupations groups: sales people and professional staff. The study was based on the premise that job commitment would be closely related to work effort and performance, while organisational commitment would be most associated with attachment to the organisation. The research sampled 56 employees of an insurance organisation and 85 professionals working for a chemical company. The results supported the hypotheses, leading these researchers to claim that the relationship between commitment types and work was both systematic and predictive. Consequently, commitment was seen as representing a normative process.

*A unified model of turnover*

Bluedorn (Bluedorn 1982) attempted to develop a model of the turnover process by synthesising three models: one focussed on causal factors, the second based on

organisational commitment and the third linked job satisfaction with turnover. The research involved a repeated measures sampling of employees (mostly women) of a large insurance company. Unfortunately, due to the policy adopted by a new managing director, it was not possible to undertake the second round of data collection proposed in the original methodology. Nonetheless, based on the single cross sectional results, the author claimed it was still possible to construct a model that reasonably achieved the initial research objective.

*Organisational factors*

Jans (Jans 1985) examined organisational factors and work involvement using a sample of Australian Regular Army officers. The research was based on an extension of the career cone model of Schein (Schein 1981). The study of a career from this perspective was presented in Figure 2.3. This approach was found to be beneficial because it provided vertical, radial and horizontal factors. Within this research, four variables were applied to represent these dimensions. Rank and career factors were represented by the vertical, while participation in decision is the radial and self expression the circumferential. Based on responses from 360 officers the results showed that involvement in specialisation was linked to self expression and career factors, while army rank had no effect on either variable.

*The moderating effect of career stage*

Cohen (Cohen 1991) provided yet another approach to organisational commitment research by examining the extent to which company loyalty was moderated across career stages. Examples of career stages were mentioned earlier in this review when developmental theories were considered. This research was based on a meta-review of 41 samples of associated literature. The results confirmed that the strength of the relationship varied not only across career stages, but in different ways across career outcomes. For example, turnover and turnover intentions were seen as being more strongly influenced by the degree of organisational commitment in the earlier stages in a career. Further, in mid to later career stages, organisational commitment was shown to be more strongly linked to performance and absenteeism. This outcome prompted the recommendation that there is a need for organisations to foster commitment across the entire career span.

*Management style*

In an Australian study, Zeffane (Zeffane 1994) compared organisational and job commitment based on perceived management style involving 300 public and private sector organisations. Data collection involved 3000 questionnaires which were distributed to 300 organisations. The results showed commitment to be higher in the private sector and that this was consistent with management style. Organisational commitment was found to be multidimensional, involving corporate loyalty/citizenship and attachment to the organisation. In both sectors, management styles that emphasised flexibility and adaptation were viewed positively, whereas those that were based on rules and regulations were adversely regarded. The extent of emphasis on hierarchy and role specialisation was a contributory factor to overall organisational commitment, but more so in relation to attachment to the organisation, tenure and supervision.

*Individualism - collectivism as an individual predictor*

Moorman and Blakely (Moorman & Blakely 1995) again focussed on demonstrating the usefulness of organisational citizenship behaviour, a variable that was introduced earlier when these authors applied it in relation to job satisfaction (Moorman 1993). In this research individualism-collectivism was applied as a predictor of organisational citizenship behaviour. Basically, individualism-collectivism was defined as a bipolar construct. One side represented an orientation to self and personal interests and the other side focussed on group considerations. To determine the extent of alignment between two, measurement was based on the beliefs, values and norms of the individual. Surveys were distributed to 210 employees of a financial services organisation in the US. The results supported individualism-collectivism was a predictor of organisational citizenship behaviour. Further, that individualism-collectivism was influenced by the extent to which an organisation promoted the group good.

### *2.4.1.5 A summary of career research from an organisational behavioural perspective*

The examples of career studies presented in this section are representative of research from an organisational behavioural perspective spanning nearly two decades. Three studies were conducted in the mid 1970s with eight each being published in the 1980s and 1990s.

While earlier researchers have criticised the field for its inconsistencies in approach (Katz & Van Maanen 1977) and the need for the establishment of a framework to address this problem (Van Sell, Brief & Schuler 1981), as a consequence of the review of this sample of literature, some features emerge that are seen of use in guiding the current research.

What has become clearly apparent is that the central issue of concern from a managerial aspect is that of mobility. The desire of industrial and governments organisations to reduce the costs associated with personnel leaving (Staw 1984) supports this observation.

While the scope of much of this research is narrow, generally there is an overlap in the issues examined and even though the perspectives might vary, the common thread relates to employee turnover. For example, apart from research that is explicitly focussed on turnover, the other views were based on job satisfaction, role stressors, and organisational commitment. The obvious link between these perspectives is that the greater the extent of negativity for each, the higher the risk that turnover will occur.

There are a number of common patterns in the methodological approaches applied in much of this research. It is limited to three forms of data collection: questionnaires, the analysis of relevant research literature and the application of labour market data. Questionnaires were the main source of data gathering and, more frequently these involved a cross sectional approach. There are two exceptions to single, one shot samplings: Argho, Mueller and Price (Agho, Mueller & Price 1993) and Bluedorn (Bluedorn 1982). The first of these studies was defined as a repeated measures, longitudinal sampling, however, the research only extended over a three month period. The second exception, although originally designed also as a repeated

measures approach, served to highlight a major risk when applying this method. A change in management and organisational policy precluded the researcher from completing the second round of data collection.

In the case of most of the questionnaire surveys, the results were based on comparative analyses. To achieve this approach researchers used a variety of methods differentiating occupational status within a single organisation, industry sectors, positional roles or industry focus. What this has served to highlight, however, is that sometimes these comparisons have been made without the benefit of an underlying common bench mark. Because of this, it has been difficult to gauge whether the differences reported resulted from the immediate comparison, or whether there were also other, extraneous causes, influencing the outcomes.

This section of literature review has served to demonstrate that one of the primary concerns of management across a number of areas of employment, is that of the mobility of personnel. While more commonly data collection were based on cross sectional sampling, potentially management oriented research necessitates current information to fill immediate decision making requirements.

### 2.4.2 Careers in librarianship

The purpose of reviewing this second area of career research is two-fold. Firstly, to examine studies in a field closely aligned in work focus with IS, librarianship. Secondly, to consider and compare the approaches applied in the two studies to be reviewed, namely the work of Morrison (Morrison 1969) and Slater (Slater 1979).

Careers in libraries are generally acknowledged as being divided between two streams, one dedicated to librarianship and the other focussed in information science. The distinctions are elaborated in the following:

> Librarianship is the more people - and service-oriented of the two occupations. A generalised soft focus, however characterises librarianship in this respect. Librarians help the general public, typically in a public library or catering for a wide variety of multi-disciplinary needs in academic or school libraries. Organisation and administration of the collection, and acquisition and retrieval of suitable books are the librarian/s business. She/he deals in books (not information) and hence does not explain or digest their contents for users.

> By contrast, information work or science is more subject-oriented, providing a focussed service in depth for well defined, limited and fairly homogeneous specialist user groups..... Information work is thus highly response-directed, concerned with putting the information in a useable and useful form (Slater 1986:59).

While the fact that these selected examples were conducted nearly three decades ago, it is argued that in the absence of modern comprehensive experiential career studies, the selection of these examples are appropriate in the context of the present research. What this second definition serves to demonstrate is the close alignment between this second stream in the library profession and the focus of the research reported in this thesis. In particular, there are at least three major areas where there is a considerable overlap. Firstly, a similarity between the positional titles of information scientists and those working in information systems. While the nature of the duties performed may

not be synonymous, at the same time nor are they mutually exclusive. For example, database, information analyst, systems analysis and systems management roles.

Secondly, as with those completing computer science or information systems majors, the careers open to librarianship graduates are not rigidly predetermined to the extent of those gaining, for example, degrees in law or medicine awards (Garoogian & Garoogian 1985). Thirdly, the earlier work in librarianship careers offers a precedent that provides an opportunity for a parallel examination of the emergence of a profession. At the time these studies were conducted that was the situation for librarianship, a process that is currently happening in the IS industry (Anonymous 2000).

### 2.4.3 The career study of Morrison (Morrison 1969)

The work of Morrison (Morrison 1969) represents an example of an early PhD dissertation conducted for the degree of Doctor of Library Science. The topic of this work was the careers of academic librarians. This is valuable research because not only is it an early example of in depth career research, but because it drew together both psychological and sociological approaches.

The study was based on a sample population of 900 people employed in libraries involving major executives, minor executives and others. The groups were established to enable comparisons to be made between responses from head librarians, departmental, section or branch heads and finally librarians without extensive supervisory responsibilities.

Within this research, a survey was administered in the late 1950s. It was based on a single, cross-sectional approach and contained three specific sections, namely:

- socio-economic origins;
- self descriptive inventory;
- career factors.

The first two of these sections reflect the multi disciplinary approach of the research. The first was dedicated to gathering intergenerational data. The second section applied a standard 'Self-Description Inventory' developed by Edwin E Ghiselli (Morrison 1969) of the Department of Psychology at the University of California, Berkeley. Obviously, this represents the psychological component. The third section, defined as career factors, gathered demographic data.

The results reported in this abbreviated version of the research do not present the results *per se,* but rather provide a summary of the implications of the findings.

#### *2.4.3.1 Socio-economic origins*

The results from the first section of the study revealed a change in the social backgrounds of librarians. That is, employment in the industry was found no longer to be limited to the children of the genteel, but involvement was becoming open to those from the labour and lower middle classes. The results also showed that few of those who achieved this socially upward mobility, ascended to the higher level executive appointments. In light of the evolution of traditional career theory this

aspect of the work is somewhat dated, it does offer some insight into a historical perspective of career research.

*2.4.3.2 Self descriptive inventory*

The outcome from the application of the personality inventory discounted that librarians could be described as a stereotypical collective. The results supported they formed a heterogeneous, rather than a homogeneous labour force sector. This outcome reflected a view more recently put forward by Bailyn (Bailyn 1989) that there will always be differences between people who might come from homogeneous social groups and similar occupations.

*2.4.3.3 Career factors*

A further significant result was that less than one percent of respondents did not hold at least a bachelor level degree. This outcome can be taken as reflecting the stage of transition in the emergence of a profession. As Morrison stated:

> the time honoured ways an occupation becomes a profession is by restricting access to those who meet the requirements and master the art ...(Morrison 1969:108).

### 2.4.4 The career study of Slater (Slater 1979)

A second and more recent, although still dated, work in comprehensive career research in librarianship was the work of Slater (Slater 1979). This study was very different in its approach to the previous example. While the research did not present a sound theoretical basis, implicitly the underlying theme was that of psychology. Data collection in this study involved a multiplicity of perspectives and methodologies. Broadly, these encompassed:

- a unit head survey;
- biograms;
- a content analysis of Who's Who in Librarianship;
- a survey of workers;
- organigrams;
- a general public survey;
- an observation of the mass media view of librarianship.

The last three of these perspectives, will not be reviewed as they are not relevant to the scope of the research pursued in this thesis. For example, the purpose of the organigrams was to build a profile of library units in the overall business structure. This aspect of the research involved the inspection of 307 organisational charts.

Table 2.7 provides an introductory profile for the remaining four perspectives that will be further reviewed. Because of the large amount and complexity of the data involved only those aspects that are of relevance will be pursued.

**Table 2.7: A summary of particular aspects of data collection**
Slater (Slater 1979)

| Perspective | Objective | Sample |
|---|---|---|
| unit heads survey | objective and subjective facts, figures and opinions | 1770 unit heads |
| biograms | work histories | curriculum vitae of 312 library professionals |
| Who's Who in Librarianship | mass check of biogram data | content analysis 1972 edition |
| worker survey | expectations, experience and self image | 303 library professionals |

*2.4.4.1 Unit heads survey*

*Turnover*

In 1977, librarianship was experiencing undesirable extremes of mobility. While overall 16% turnover was demonstrated, at the same time 55% of the units sampled reported a static labour force, which, in effect meant that actual mobility increased to 35%.

*Reasons for leaving*

In the opinion of the heads of units the causes for turnover were found to be due to a number of common reasons. In decreasing order of frequency these were:

- careerist reasons, ambition, promotion prospects, career and grading structure;
- mercenary reasons, both positive and consciousness negative financial rewards, security;
- self development reasons: job satisfaction and content; training and educational opportunities; experience broadening;
- environmental reasons and attractions; materialistic, hedonistic and organisational factors like conditions of work, management policy;
- occupational image: seeking a sector of the field where library/information workers get more respect and better treatment;
- personal situation and personality factors including motivation.

*2.4.4.2 Biogram, Who's Who in Librarianship results*

The application of the biogram approach was to request those targetted to provide an current CV. The outcome of this approach served to highlight two major problems experienced in this study. Firstly, the response rate, acknowledged by the author as disappointing, was 12%. Secondly, even though only 300 responses were received, the researcher found it almost impossible to analyse the diversity of data this approach generated.

To support the relatively small sample obtained from the approach, a back up source of data, the Who's Who in Librarianship (1972 edition) was subsequently drawn upon. Apart from adding support to offset a less than representative sample, the benefit of this additional information was that, although it was considered to be comparatively sparser, the standardised format offered an ease of processing.

The combined biogram and Who's Who in Librarianship results were divided into four sections:

- personal demographics;
- professional demographics;
- career patterns;
- wastage.

For the purposes of this review only aspects of results from the first three sections will be considered.

*Personal demographics*

The first component of the results reported personal demographics. These included age, gender, marital status, family, geographic region and occupational sectors. Overall these results showed that occupation focus within librarianship was divided between two discrete fields, librarian and information scientist. This differentiation had implications for the tertiary backgrounds of graduates. Librarianship was more based on bachelor degrees in arts, humanities, the social sciences whereas information scientists were shown as more likely to hold engineering and science or technical qualifications. While there was some movement of personnel between the two occupational areas, it was limited to one direction. Librarians transferred into the information science area but there was no evidence of information scientists moving into librarianship.

Finally, according to both the biograms and Who's Who results, overall and regardless of gender, the greater proportion of employees in the library profession work were involved in library work. This result was particularly the case for female employees to the extent of nearly a 90% involvement in library duties.

*Professional demographics*

The second aspect of career pattern results focussed on what were defined as professional demographics. These provided details of the qualifications held by respondents, current job level and tenure, average active work activity, work experience and projection of mobility trends. The initial results indicated that employment was distributed between the following sectors: public (23%), educational (37%) and special libraries (38%). The hierarchical structure of libraries was shown to be commonly based on four tiers: boss, senior, intermediate or junior. Within these men dominated the upper levels while more women employees were engaged in the intermediate and junior levels.

In this research mobility was given a consider amount of attention. Accordingly the results were reported from a number of perspectives:

- length of time in present job;
- average length of active working life and average age;
- average number of jobs held to date;
- average time stay in job;
- probable average number of jobs in working lifetime.

Apart from the projection of expected working life time, these results were compared on the basis of:

- library sample;
- information sample;
- gender;
- public library;
- educational library;
- special library.

The scope and complexity of the results this approach generated, precludes explaining quantitative outcomes in the context of this review. The primary aim in presenting a brief insight into this aspect of the research is to demonstrate the application of analysis from multiple perspectives.

*Career patterns*

The third area of the results focussed on career patterns which were defined as involving:

- combinations and permutations of work experience;
- entry to the profession;
- comparison of the attractiveness of different sectors;
- internal and external mobility.

To further reinforce the scope of Slater's research (Slater 1979), all these results were also based on a number of levels of analysis. Consequently, again because of the complexity and amount of information, the quantitative outcomes will not be presented in this review.

*2.4.4.3 Worker Survey*

This aspect of the results were based on the perceptions reported in the worker survey that accompanied the request for biograms. The issues raised included basic direction of work motivation, job satisfaction (current post), original motivation and entry to the field, the hypothetical second chance, comparisons with other jobs, the functions of other jobs and a cartoon test.

For the purposes of this review only two aspects will be reported as they are relevant to the research reported in this thesis. For the self-image results the data were divided into three groups. These were defined as inner-directed, outer-directed and ambi-directed. These follow typologies and identified introverted and extroverted or dual personality types. Basically what emerged from these results was that inner-directed workers are more dominant in specialist libraries (63%). In the two remaining occupational sectors, the workers were more likely to have subscribed to the ambi-directed typology. In public libraries this was to the extent of describing 39% of employees ( although a similar proportion were inner-directed) and in educational libraries, this accounted for 42% of the workers.

The results for job satisfaction, were based on an open response question. These involved 22 areas and nineteen rankings. Of these the five issues that were shown to promote job satisfaction were feelings of usefulness, gregariousness, problem solving, involvement in searching and autonomy. Negative influences mainly

stemmed from the non professional element of duties, followed by the social level of the organisation, monotony/routine work, low status and stress.

### 2.4.5 The application of careers research in librarianship in the context of this present study

The review of the two previous studies, which both centered on career research in the librarianship labour force have created a number of considerations in developing the approach for the present study. While it has been recognised these examples of career research are dated, in the absence of more comprehensive studies their methodological contribution is still worthwhile.

In particular, the study conducted by Slater (Slater 1979) provided an insight into potential problems when applying a CV as a work history data gathering instrument. While more recently Dex (Dex 1991) has recommended the use of the CV as a source of data in such research, before adopting this technique the experience of Slater (Slater 1979) highlights a number of issues need to be taken into account. Most important is an awareness that CVs can be highly diverse in structure, scope and also the length of career contributing to the content.

Another feature of these studies was that both surveys were largely based on a cross sectional approach. While it is accepted that the application of a CV as one form of data collection proved problematic in the work of Slater (Slater 1979), apart from mobility calculations, there appears to have been no recognition of the time in the other aspects of a career.

Mobility within the library industry was given considerable attention in the work of Slater (Slater 1979), however, details of how the averages reported in the results are not given.

The self perceptions of librarians was topical in both studies, and in that by Slater (Slater 1979), this issue was extended to gather data based on public image. This tends to suggest that at that time, this group of workers was also considered to be somehow unique by comparison with other work force sectors. This issue will be again raised in relation to IS personnel in the next chapter, and later parallels will be drawn in relation to the developmental stages in emergence of new professions.

## 2.5 Initial post-graduation appointment

This section is dedicated to a consideration of the initial post-graduation appointment and as such, the foundation period of a career. Two particular aspects will be presented, these aim to:

- demonstrate that with reference to broader career theory, there is considerable alignment between the different approaches proposed within this period;
- substantiate that as this stage in a career is central to future career decisions, it should form an essential inclusion in longitudinal career research.

In light of the chronic shortage of skilled IS personnel, it is proposed that this aspect of a career is a highly relevant issue. It will offer some insight into the considerable

forces that exert positive or negative perceptions of experiences during this time. Ultimately, it is proposed that both these perspectives will inherently support the inclusion of second research question posed in this thesis. To recap this is:

*With reference to the initial post-graduation appointment and with a particular focus on original career choice, business sector and geographic location, how did graduates approach gaining and accepting the position and what is the extent of their mobility when engaged in this role?*

For some, though not all graduates, the initial post-graduation appointment represents the first contact with organisations and an introduction to the realities of the business world. The first job is a milestone in a career, meaning positive and negative outcomes persist in memory (Baker 1991) and therefore can influence future career decisions.

> mobility in the earliest stage of one's career bears an unequivocal relationship with ones later career, predicting many of the most important parameters of later career moves: career 'ceiling', career 'floor' as well as the probabilities of promotion and demotion in each successive period (Rosenbaum 1979b:220).

Cohen (Cohen 1991) described career stage (meaning age and tenure) as a moderator of organisational commitment and that this would vary, dependent on the availability of the opportunities and attractive alternatives for the individual. He also saw a paradox in this stage in a career. That was, while new graduates were establishing commitment to an organisation, they were also simultaneously keeping their career options open.

Consequently, there was a general acceptance that movement would be highest at this point in a career as original career decisions were either discounted, swayed or else consolidated. It is therefore not surprising that one of the dominant characteristics of research into graduate careers was the high job mobility during this period.

> The process of finding work in which ones skills and abilities are used and in which commitment and energy are rewarded with job satisfaction and responsibility is not often accomplished quickly ..... However it is during this time that the process is at its most active and its most transparent (Brennan & McGeevor 1988:19).

A major survey of graduates covering a range of degree awards conducted in the UK between 1982-1985 showed that 58% had changed their jobs twice or more in a three year period and 43% changed their employment status (Brennan & McGeevor 1988). Mabey (Mabey 1986), from a review of such studies concluded that a 50% turnover represented a reasonably constant rate of employment mobility of graduates in their initial appointment. Newly appointed IS personnel were also regarded as susceptible to high turnover (Igbaria & Greenhaus 1992b), which was more prevalent within the first year or so of employment (Martin & Shell 1988).

### 2.5.1 Career theory and the initial post-graduation appointment

While the various approaches underlying career theory are diverse, in relation to the initial stage in a career there is considerable alignment and overlap. Many of these approaches also support the long term influence of the first position experience during this time and future career decisions. Positive outcomes within the first position are seen as influential in promoting subsequent career achievements (Morrison 1969); (Kaufman 1974).

From the different approaches that collectively form the notion of broader career theory examined earlier in this chapter, the one possible exception to a common theme that applies to the initial career stage, is that of the sociological intergenerational perspective. While it still retains some explanatory power, the reproduction of careers across generations is no longer a significant career research issue. In particular, the changes in society means than many traditional careers are no longer part of the modern business environment. In a society that now encourages and supports education, the socio-economic circumstances of the family are increasingly less of a barrier to the career options available to newer generations.

The parallel, earliest career theory from a psychological perspective, trait theory (Holland & Gottfredson 1981) also stands apart, but does offer some insight into the starting point in a career. This approach is based on an underlying premise of matching the personal characteristics of the individual and those of the work environment. While it is generally regarded as a static approach, it is nonetheless directed at the initial stage in a career and as such is still frequently applied as a means of filtering recruitment applications. Extending this, the organisational career cone developed by Schein (Schein 1981) describes the process of a career within an organisation and locates the new employee at the periphery of the organisational structure.

Despite the fragmentation and diversity underlying the broader career theory, in relation to the initial stage in a career there is considerable unity. The mutual themes that can be identified relate to adjustment, the forces that come in to play during this time and also the outcomes that result from this experience.

The developmental theory of Super (Super 1981) and the concept of socialisation from Schein (Schein 1983) share a similar focus in describing the initial stage in a career as being one of adjustment. Consequently, this draws together counselling psychology and sociological approaches to career theory. Super (Super 1981) defined the first stage of employment as a time when the concept of self, having been developed prior to entry to the labour force, is tested and revised with respect to the working environment. This adjustment between the individual and the organisational environment also provides the premise for the notion of socialisation. When a new recruit begins working within an organisation there is a period of adjustment as the entrant is made aware of the culture that governs social behaviour as well as both the formal and informal rules characteristic within that particular environment (Schein 1983).

From a sociological career theory perspective, both the intragenerational perspective and also the developmental models provide some insight into the early career. Within the intragenerational perspective, the notion of the tournament model (Rosenbaum

1979b) provides an explanation of the process in relation to the initial stage in a career. This model proposes career progression as a competition, where a series of rounds determines who is successful and how the runners up then must face new opponents in subsequent tournaments. The central issue is that rapid promotion in the earlier stage is seen as a predictor of future performance and career achievements.

Two aspects from the developmental models within sociological career theory also serve to emphasise the significance and long standing influence of initial career experiences. Firstly, the notion of career anchors (Schein 1978) which describe the career patterns formulated during this time and are seen as governing future career decisions. Secondly, the stages in a professional career (Dalton 1989) which highlights the potential implications of challenge, training, appraisal and counselling during the entry point in a career. From these developmental approaches if the outcome is positive, then it is more likely that initial career choices will be consolidated and long term career decisions formulated.

Finally, political theory and economics career theory can be drawn in to offer some insight into some of the major determinants affecting this process of adjustment in the early career. From a political career theory perspective, power and power shifts in an organisation are effective at the very earliest stages in a career. The influences that come to bear during this time begin with the politics of hiring standards, the selection process, mobility, wages and succession.

The politics of the dominant group are fundamental determinants of the culture of an organisation. The approach to recruitment, selection and hiring is driven by those in power to ensure their own on-going control. This draws on the notion of homosocial reproduction, which implies that people already in the organisation seek to maintain their own best interests by influencing the process (Pfeffer 1989). Consequently, the means of attracting applicants and the standards implemented for selection will be oriented towards obtaining new personnel who are more closely aligned with the interests of the dominant group in the organisation.

Economics career theory serves to highlight the importance of the first career choice, in particular the criteria graduates apply when deciding to accept an appointment. It explains that the role of expectations on the part of both the individual and the employer is based on the notion of human capital. That is, graduates because of their considerable investment in education, enter the labour force with expectations of return. At the same time the organisation has made an investment during the recruitment and selection process also with an expectation of return. Obviously, what is critical here is that for both parties the levels of expectations are realistic. The greatest risks for the graduate is that the extent to which they perceive the organisation in a positive light can be influenced by a successful outcome from the recruitment process (Arnold & MacKenzie Davey 1992). Another problem is that graduates can be vulnerable to being attracted to organisations who require specific skills to fill an immediate human resource need and in return such appointments often offer only minimal or no long term career prospects. It is proposed that this could prove to be the case for many IS graduates, where large software development projects create an immediate, though short term, demand for extra programming staff.

### 2.5.2 Career research and the initial post-graduation appointment

To gain some understanding of the initial appointment in a career it is necessary to consider a number of issues that are probably at their most influential during this time. This will be based on the work of eminent researchers in the topic, of Arnold and MacKenzie Davey (Arnold & MacKenzie Davey 1992). It was based on a large scale project involving the initial career experiences of graduates employed in eight major UK companies representing financial, pharmaceutical, chemical, engineering and food and distribution industries. Within the context of this thesis this research is also highly applicable because just under 10% of those who participated were engaged in systems analyst/IT roles.

The research was based on the sampling of graduates with up to three years employment experience. A total of 797 graduates (representing a response rate of 62%) responded to what was described by the authors as a lengthy questionnaire. The instrument was developed specifically for the purpose, in light of reference to the relevant literature and pilot interviews conducted with 80 graduates (Arnold & MacKenzie Davey 1992). It was divided into three main sections. The first gathered biographical information while the second contained 26 questions dedicated to the reasons why graduates accepted the appointment. The third section was based on 165 questions dedicated to a number of perspectives of graduate experiences linked with those outlined in the scope of the research.

Basically, the main findings reported on graduate perceptions from a number of perspectives, namely:

- reasons for joining the company;
- selection and induction;
- work characteristics;
- employer organisation;
- feedback on their work;
- training and development;
- career prospects in the organisation;
- pay and benefits;
- people in the workplace.

Overall, this research highlighted that the experiences of graduates differed between organisations making the work environment a determining factor. However, Arnold and MacKenzie Davey (Arnold & MacKenzie Davey 1992) cautioned the generalisability because the research was limited to large, commercial organisations. Despite this acknowledged bias, the results are highly relevant in the context of this present study and so a brief summary of the results will follow.

*Reasons for joining the company*

Based on the sample population, the results for this aspect of the research showed that while the extent of importance differed slightly between organisations, the top three determinants were found to have been long term prospects, training and interesting work. More recent graduates, however, regarded training as the most significant criteria, followed by long term career prospects and interesting work. The least influential determinant for positional choice for these graduates was location.

Those who were in their second or third year of employment tended to rate interesting work second to long term prospects and training. This outcome suggests that, as graduates become more familiar with the realities of the organisation, they have tended to reprioritise the importance of these issues in their careers.

*Selection and induction*

It was apparent from this portion of the results that there was some support that success in the selection process had some influence on how graduates perceived the selection and induction procedure. In this sample it was demonstrated that recent graduates were more positive in their responses than those with longer involvement in the labour force. Arnold and Mackenzie Davey (Arnold & MacKenzie Davey 1992) argued that another explanation could also be simply a factor of memory recall. In keeping with the earlier noted differences between organisations, it could simply be the variations in the approaches used in different work settings.

*Work characteristics*

This section of results is highly relevant with reference to the developmental model of Dalton (Dalton 1989). It showed that, while generally graduates did not perceive they had faced work challenges that fully extended their capabilities, they did record gaining improved skill as a consequence of their job involvement. This perception was seen as increasing over longer tenure. Graduates also reported a moderately high work load, some autonomy and involvement with senior management and decision making.

*Employer organisation*

While generally graduates employed in those organisations undergoing cultural change were aware it was happening, they were not necessary kept up to date with developments. Graduates indicated minor criticism against the bureaucracy largely related to being encouraged to follow long standing work practices. However, they conceded that in some work areas, routine was essential to ensure the safety standards were maintained.

*Feedback on work*

This was yet another aspect that reflects the work of Dalton (Dalton 1989). A common theme in this aspect of the results was that, overall, graduates were unsure of the measures applied to gauge their work performance. There was also some indecision whether assessments were conducted often enough. These outcomes were unaltered when tenure was factored into the results.

*Training and development*

Recent graduates were more positive in supporting they had been given acceptable levels of training and self development. However, it did appear that in many of these organisations training programmes appeared to have been on an ad hoc rather than based on planned scheduling.

*Career prospects in the organisation*

While overall graduates felt their employer organisation offered career paths, many lacked any real knowledge of the options available to them. Graduates with a shorter tenure considered work performance to be the main determinant of maximising available career options. Those with longer involvement in the organisation reported

knowing the right people, and being in the right place at the opportune time as also being of equal importance.

*Pay and benefits*

This aspect of the results again highlighted the considerable differences between organisations, although graduates largely reported pay and benefits to be competitive. Further, this outcome did not change when remuneration was considered in light of being determined by work performance or overtaken by more recent recruits.

*People in the workplace*

There was unanimous agreement among these graduates that they felt acceptance by work mates and also found that they were willing to provide assistance. Further, most considered access to the boss to be readily available. However, again for those with more long-standing experience in the organisation, these perceptions tended to be less positive than those of recent graduates.

Within this section, the focus has been on the initial post-graduation appointment. In order to substantiate why this period in a career is an essential inclusion in research where careers are under scrutiny, the objective was two-fold. Firstly, to establish that despite the fragmented nature of the broader career theory, there is a common recognition of the importance and potential influence of experiences from this appointment. Secondly, to provide a brief summary from a comprehensive research study dedicated to this topic in order to demonstrate the complexity of forces that come into play during this time.

## 2.6 Summary

To recap this chapter was based on the following areas:

- career theory;
- general career theory research;
- initial post-graduation appointment research.

### *2.6.1 Career theory*

The examination of the foundation of perspectives underlying career theory has served to provide some insight into the foundations of what is a highly complex and fragmented theory. The outcome from this process has provided a broader understanding of the issues and focus of the various perspectives that collectively contribute to the notion of career theory.

In particular, in relation to career theory this portion of the review has:

- provided a foundation background in broader career theory and in so doing, offered an insight into the multiplicity of perspectives encompassed;
- demonstrated the fragmentation and diversity of approaches underlying the broader career theory;

- established the complexity of issues that potentially influence career outcomes and so determined there is no single appropriate approach to guide career research;
- served to discount a number of approaches implied within the broader career theory as beneficial within the present research;
- emphasised that a career was dynamic and needed to be examined over time;
- confirmed considerable agreement existed in relation to the initial stage in a career to be one of adjustment in self concept in relation to the organisational environment;
- introduced the change in the nature of a career away from the concept of a long-term contractual relationship between an employer and employee to a modern view founded on short term, mutual benefits.

### *2.6.2 General career research*

The review of general career research has highlighted that a considerable body of work has been conducted into issues that mainly address management needs and concerns. It has also demonstrated that while implicitly some of these studies have a background in career theory, many have no theoretical basis.

The review of general career research in this chapter has:

- established an insight into organisational behavioural perspective of career research;
- revealed the considerable amount of career research that has been driven by a management perspective and as a consequence has largely been limited to the examination of employee work activities and attitudes;
- identified mobility as a common thread in organisational behavioural career research;
- demonstrated the wide application of questionnaires in career research which have largely encompassed cross-sectional, or less frequently, repeated measures samplings;
- identified some of the problems arising in cross-sectional approach and the vulnerability of repeated measure samplings;
- provided examples of comparative analyses of results and shown that many of these have been based on widely diverse positional roles or areas of business activity with no common benchmarked background.

*More comprehensive career research*

The examination of more comprehensive career research in an area closely related to information systems, librarianship, has been beneficial in two areas. Firstly, it has identified some parallels between these two career areas, in particular:

- both fields are divided between a common focus in technology and, for information systems business activities, while for librarianship the second stream represents a nurturing focus;
- provided a historical perspective of the emergence of librarianship as a profession, which is now the case for IS industry;

- established that librarians were perceived to have a specific image as an occupational group that required research investigation;
- identified a considerable shared interest into mobility and high turnover;

Secondly, it has offered some methodological insights into career research which still remain appropriate. That is, the review of this area of literature has:

- demonstrated the application of multiple sources of data collection;
- considered career research based on the application of a CV approach;
- gained support that a descriptive, quantitative approach was not simply appropriate, but positively desirable in career research (Slater 1979);

### *2.6.3 Initial post graduation appointment*

The final section focussed on initial post-graduation research. It showed, that in relation to this stage in a career, there is considerable agreement among the different perspectives making up career theory and that the outcome from this period in a career be a long lasting influence in subsequent career decisions.

In this chapter this portion of the review has:

- substantiated the significance of the initial post-graduation appointment in a career;
- demonstrated the range of issues of influence within the initial post-graduation appointment;
- identified a precedent to support the application of a purposefully constructed instrument (Arnold & MacKenzie Davey 1992);

As a consequence of these outcomes, it is proposed that Chapter Two has served to:

- construct a synthesis of career research;
- initiate the development of a framework to locate the current research presented in this thesis with respect to the broader career theory;
- provide a guide to identify potential perspectives for future IS career research.

## 2.7 Implications for the current study

It is proposed that, for the purposes of the present research, this chapter has identified a number of important implications for the research presented in this thesis. In particular it has:

- demonstrated that there is no one, single career theory to guide career research;
- discounted a number of approaches implied within broader career theory as beneficial within the present research;
- revealed that generally the bulk of career research has been driven by a management perspective and there has been little work on the actual work history experiences of employees;

- highlighted that when comparative outcomes are incorporated into general career research design, often these have been based on disparate work groups or areas of business operations;
- identified mobility as a common thread in much of the general career research;
- established cross-sectional, or less frequently, repeated measures samplings as the major approached applied in career research questionnaires;
- identified comparative analysis as a primary means of analysis in career research;
- substantiated the significance of the initial post-graduation appointment in a career;
- demonstrated the range of issues that influence the outcomes within the initial post graduation appointment.

Chapter Two has established a foundation in career theory to serve as a contextual background for the research presented in this thesis. It has provided an understanding of the diversity of both static and dynamic approaches a study of careers could potentially encompass. This represents a fundamental basis to inform in the choice of approach applied in the present study.

While some areas of career theory, when taken in isolation, can be dismissed as irrelevant this does not necessarily mean they are of negligible benefit in deciding an approach. For example, it could be argued that congruence theory as a static approach has little to offer because it is based on an assumption that individual traits and environmental situations remain constant throughout the employee and organisational relationship. It could also be debated that this theory has the potential to provide a starting point to the decision process. By their enrolment in computer science or information technology majors, the graduates that are central to this research have demonstrated they shared similar predispositions towards future employment in an IS environment.

The fact that potentially a proportion of these graduates have not continued on and initiated careers in IS highlights that change and the dynamic nature of a career needs to be taken into account. Even apart from the notion of a protean career, the political and economic approaches to career theory further emphasise that a career is flexible. Throughout a career, mobility will be driven by political and economic considerations.

Both industrial sociology and industrial psychology have highlighted that the two major forces in a career are the organisation and the individual. However, the subsequent examination of career research has revealed that the bulk of this work has been generated from an OB perspective. This has revealed a gap in knowledge and a need for career research from the perspective of individual work history experiences. Largely these OB studies have also taken a cross-sectional approach whereas, from a broader career theory perspective, there is evidence that as a career evolves over time, making a longitudinal approach essential. In particular, developmental theories promote this view.

The examination of more comprehensive career research, with the focus on studies in librarianship has been beneficial in drawing a parallel between the past and the present and the emergence of a new profession. It has also highlighted that many of the issues that have driven research from the perspective of librarians in the past are similar to those now driving IS career research. In particular these relate to ascribed stereotypical characteristics and labourforce shortage of skilled workers. The novel application of a curriculum vitae approach to data collection and the associated problems have also proved informative for the present research.

Finally, the examination of research focussed on the initial post-graduation appointment has reinforced that this is a pivotal point in a career. It has demonstrated the considerable forces that can influence work outcomes at this stage and supported the notion of a reality shock experienced by many new appointees. What this does signal is the importance of this period in a career especially where worker retention is essential to overcome a shortage of skilled workers. A further implication is that the initial post-graduation appointment should not be looked at in isolation. While some career changes between industry focus are to be expected, these may not necessarily be permanent. That is, it is reasonable to expect that career movements between IS and non IS career involvement will occur during the subsequent stages in a career. This portion of the literature review has highlighted that while there is a need to look at the initial career experiences, it is also necessary to consider these in the context of later career movements.

# CHAPTER THREE: IS career research

## 3.1 Introduction

This chapter is dedicated to a review of IS career research. It is structured to achieve four primary objectives. Firstly, to examine studies that have been based from an organisational behavioural perspective and which are representative of the bulk of IS career research. Secondly, to report examples of more comprehensive and/or longitudinal approaches in IS career research. Thirdly, to compare and relate the outcomes from the first two objectives with the results obtained in the earlier review of broader career theory. Fourthly, as a consequence of the comparisons, to consider the issue of theoretical background and then to establish the perspective, scope and approach for this present study.

It is proposed that through the adoption of this approach Chapter Three will produce the following outcomes:

- a consolidation of the approach used in the present research reported in this thesis;
- a guide for future IS career research now extended to also encompass existing IS career research.

Essentially, the recommendation of Myers (Myers 1991) will effectively be applied. To recap, this is to claim that the present research, as a component of an emerging field, will have gained the benefits of the research experiences of others engaged in other fields. Further, this resource will now be documented and available to future IS career researchers.

## 3.2 Background

Before initiating the review of IS literature proposed for this chapter, it is necessary to again reiterate support for the claimed fact that there is a scarcity of IS career research. Even though this situation has long been acknowledged, it still remains an issue that is yet to be addressed.

Ginzberg and Baroudi (Ginzberg & Baroudi 1988) described the limited availability of attention focussing on careers {and career planning} within the DP/MIS field. In support of this view they cited the very few examples to be found in the Special Interest Group on Computer Personnel Research (SIGCPR) conferences which have been held annually in America over a twenty year period. Consequently, Ginzberg and Baroudi (Ginzberg & Baroudi 1988) drew on general career theory when dealing with the theoretical perspective of MIS careers. More recently, McLean, Tanner and Smits (McLean, Tanner & Smits 1991) adopted a similar approach in researching the management of new MIS professionals. McLean (McLean, Tanner & Smits 1991) pointed out that there was a discrepancy between the size of the knowledge base, the large number of people employed in the industry and the dynamic nature of the work performed. All these authors, who are eminent in this area of research, readily acknowledged the dearth of research dedicated to the careers of IS personnel

(Ginzberg & Baroudi 1988); (McLean, Tanner & Smits 1991) and also, the lack of longitudinal studies focussed on the topic (McLean, Tanner & Smits 1991).

In Australia, empirical research focussing on IS careers is all but non-existent. As reported in Chapter One, an extensive search of potential sources of research on the topic in this country, revealed only two examples: the work of Dengate (Dengate, Cougar & Weber 1990) and the study conducted by Cameron (Cameron 1991). This outcome is significant given that, for almost a decade, the Australian government and professional associations have invested considerable resources in investigations that have unanimously recommended the crucial need for such information to be made available (IIETF 1990); (IIETF 1991); (DEET 1992); (IIETF 1993); (ASTEC 1995); (AIIA 1999b).

## 3.3 IS career research

The application of the context of broader career theory (Figure 2.5) located a majority of existing IS career research as coming from an organisational behavioural perspective. There is also a second (albeit very limited) stream of research that has adopted a more holistic approach to the study of careers in the IS industry. Within this, the work of McLean, Tanner and Smits (McLean, Tanner & Smits 1991) has come to be regarded as seminal research on the topic.

### 3.3.1 IS career research from an organisational behavioural perspective

In the view of Ginzberg and Baroudi (Ginzberg & Baroudi 1988) the scope of the limited IS career research that was available, has been contained to a small number of relevant career concepts. Examples of IS career research from an organisational behavioural perspective, that demonstrate the approaches and the issues addressed will be examined in the section to follow:

- IS careers from an HRM perspective;
- IS careers from an IS personnel perspective;
- motivation;
- job satisfaction, role stressors, turnover and commitment.

### 3.3.2 IS careers from a HRM management perspective

Much of the IS personnel research literature can be attributed to the widely held perception that computer personnel are different to the extent that they represented a unique labour market sector (Jackson 1986); (Fitz-enz 1978). This has given rise to the concept of a DP profile (Jackson 1986) which acknowledged these people as a distinct occupational group (Igbaria & Baroudi 1995) that, from a corporate management perspective, have come to be regarded as special cases (Westerman & Donaghue 1989). Consequently, it is not surprising that a number of the studies reported in the literature have been conducted largely from a human resource management perspective. While the objective of this stream of research has been worthwhile, it was also unfortunate. It has served to reinforce these employees to be outside normal management practice, and so perpetuated the notion that IS employees represented an anomalous work sector. At the same time, there have also been those who questioned that IS personnel were, in fact, an exceptional case in human resource management (Turner & Baroudi 1986); (Ferratt & Short 1986).

The first part of this review of IS career literature, from an organisational behavioural perspective, will consider work directly related to managerial concerns. The examples reviewed date back to the early 1980s which demonstrates that any serious attempts to discount this view of IS personnel as a unique occupational group has been largely unsuccessful. Examples of this research are Bartol and Martin (Bartol & Martin 1982); Turner and Baroudi (Turner & Baroudi 1986); Couger (Couger 1988); Woodruff (Woodruff 1990) and Burn, Ma and Tye (Burn, Ma & Tye 1995).

#### *3.3.2.1 MIS personnel and the implications for managers*

Bartol and Martin (Bartol & Martin 1982) presented a review of MIS personnel literature and as a result, offered suggestions for future research. They also highlighted the implications and challenges they perceived IS managers would face in the future. Their main conclusion was that empirical research in the area had been relatively limited. The few studies that were available had also mostly focussed on the perspective of the individual employee. Despite these findings, these observations were repeated some years later by other notable IS personnel researchers (Ginzberg & Baroudi 1988), which has served to highlight that despite a number of attempts, the area of IS careers has failed to attract growing research attention.

#### *3.3.2.2 MIS occupations*

Turner and Baroudi (Turner & Baroudi 1986) questioned that IS personnel represented a unique challenge for management contending that, when compared with similar occupational groups, there were relatively few differences, a view also supported by Ferratt and Short (Ferratt & Short 1986). The research conducted by Turner and Baroudi (Turner & Baroudi 1986) was based on interviewing top and middle managers as well as five IS managers in a number of US companies. Additional sources of data collection were a search of relevant literature in the trade press and a review of IS literature. The results from the interviews revealed common issues of concern were: turnover, burnout, career path, commitment, supervision and compensation. These findings were supported in the outcome from the review of literature. This lead to a conclusion that there was a lack of attention to IS personnel related issues.

This research culminated in the construction of a model of worker behaviour. It was based on two dependent variables: productivity and well-being. The first was said to be focussed on output and the performance of the employee, while the second allowed the well-being of the worker to be taken into account. Six independent variables were defined: performance rewards, supervisory relations, work environment, technology, individual differences and controls. Within these a number of issues were identified. These are shown in Table 3.1:

**Table 3.1: Model of worker behaviour**
(after Turner and Baroudi (Turner & Baroudi 1986))

| Independent variables | Issues |
|---|---|
| *Performance reward:* | |
| | worker motivation |
| *Supervisory relations:* | |
| | technical supervision |
| | closeness of supervision |
| *Work environment:* | |
| | role ambiguity |
| | role conflict |
| | specialisation and repetition |
| | challenge and responsibility |
| | abstraction |
| | social support and interdependence |
| | 4 dimensions from JDS*: |
| | • skill variety |
| | • task identification |
| | • significance |
| | • feedback |
| *Technology:* | |
| | tools |
| | processes |
| | form of project organisation |
| | project control |
| *Individual differences:* | |
| | age |
| | sex |
| | education level |
| | participation in professional activities |
| | perceptions of professionalism |
| | value orientation |
| | prior experience |
| *Controls:* | |
| | industry |
| | firm |
| | organisational culture |
| | group culture |
| | grade |
| | title |

* Job Design Survey from Hackman and Oldham (Hackman & Oldham 1980)

A further finding based on the review of IS literature lead Turner and Baroudi (Turner & Baroudi 1986) to disagree with the practice of viewing IS personnel as engaging in an analogous job. Consequently, this meant that staff composition was also proposed as an essential consideration. Two perceived outcomes were proposed from the addition of this variable. Firstly, it would provide a means to determine the extent to which IS personnel differ in relation to the model and, secondly, it would to determine variances with other, referent occupations.

#### *3.3.2.3 Key HRM issues in IS in the 90s*

The study of Couger (Couger 1988) reported a comparison of the views of IS executives and human resource executives in relation to the key issues they would face in managing IS personnel in the1990s. It was based on a three round Delphi

methodology, with the objective of capturing the dominant factors and reaching consensus in the ranking of their importance. The results showed that IS directors agreed the top ten issues would be to:

- acquire stronger business orientation;
- prepare strategy to transfer certain IS tasks to users;
- retrain personnel, define skill requirements for future IS environment;
- encourage managers to be businessmen rather than technologists;
- emphasise creativity and innovation;
- provide training in communication and behavioural skills;
- find new ways to motivate employees;
- develop better measures of performance and reward principal contributors.

Human resource executives indicated consensus that they perceived it would be important to:

- focus on better human resource planning;
- improve leadership and management skills;
- increase business knowledge;
- increase productivity and motivation;
- implement new compensation and reward programs;
- keep up-to-date technologically;
- upgrade recruitment and selection techniques;
- adjust to shifting values and work force composition;
- improved approaches to career planning and retention;
- motivate maintenance personnel.

Although the rankings differed, when these results were compared, it showed that both groups were in agreement in six of the ten key issues identified. This was regarded as showing considerable unification in the approach to managing IS personnel. The fact that significant issues were identified, and a proper emphasis directed at areas of planning and implementation, were also regarded as positive outcomes from this research.

#### *3.3.2.4 Managing for results*

The primary purpose of the research reported by Woodruff (Woodruff 1990) was to gauge the extent to which organisational practices influenced job satisfaction and job performance among IS professionals. It was based on a model that proposed organisational practices were determined overall by culture, formal and informal practices and climate. Collectively, these then contributed to the perceptions individuals formed about the way an organisation operated. These were determined through reference to people, structural and task orientations. In turn the two fundamental outcomes were job satisfaction and job performance.

The study was based on a sample of 202 employees from twelve IS organisations. Each of these workers had between one to five years experience with their first, and current, employer. The sample was divided into four professional groups: system analysts, programmer/analysts, programmers and operations personnel. A

questionnaire was administered to gather the views of these employees according to people, structural or task oriented factors, describing ten areas of management practice. Table 3.2 shows a summary of the structure of orientations and the issues these involved:

**Table 3.2: Structural orientations and issues**
(after Woodruff (Woodruff 1990))

| Organisational practices | Management practices |
|---|---|
| **People orientation:** | |
| | management ability to make decisions and select personnel |
| | job pressure |
| | management receptiveness and intergroup co-operation |
| | personal development |
| **Structural orientation:** | |
| | adherence to chain of command |
| | avoidance of conflict in direction, formalisation and tolerance of error |
| **Task orientation:** | |
| | adequacy of communication |
| | adequacy of authority and group adaptability |
| | adequacy of system and project planning |
| | avoidance of conflict in system and project implementation |

The results from this research showed that while there was a statistically significant relationship between job satisfaction and job performance, the correlation was weak. While the strength of the relationship varied within the four professional groups, both job satisfaction and job performance were shown as related to perceptions of organisational practice. Two perceived organisational practices were found to influence job satisfaction significantly: management ability to make decisions and select personnel, and management receptiveness and intergroup cooperation. Job performance variance was explained by only three, people-oriented factors: job pressure, management receptiveness and intergroup cooperation, and emphasis on personal development. The results also revealed a strong correlation between reward satisfaction and performance. As a consequence of this research, it was recommended that managers needed to be aware of the relationship between organisational practices and a desired outcome for satisfied and quality IS employees.

#### *3.3.2.5 Managing IS professionals in a global environment*

The final example of IS personnel research from an HRM perspective, was the work of Burn, Ma and Tye (Burn, Ma & Tye 1995). This was highly topical because technological advancements and the linking of computers and communications have changed the nature of business. In particular, these have served to create a global economy and one where the HRM issues faced by IS managers have been compounded by a need to direct IS personnel across a cross-cultural environment (Burn, Ma & Tye 1995).

This study was based on making comparisons between IS personnel working in Hong Kong and the US. It focussed on those engaged in three occupational roles: programmer, analyst/programmer and analyst. Two forms of data collection were involved. The first drew on a modified version of the JDS (Hackman & Oldham 1980) to measure motivation potential, individual growth need strength and

individual social need strength (JDS refers to the Job Redesign Survey from Hackman and Oldham (Hackman & Oldham 1980)). The second aspect of data collection involved ten social dimensions. These were classified as:

- respect;
- his face;
- my face;
- communication apprehension;
- wanted control;
- expressed control;
- wanted affection;
- expressed affection;
- wanted inclusion;
- expressed inclusion.

The results revealed strong, culturally based differences between those employed in these two countries. This lead these researchers to caution that, when operating in a global work environment, it is inappropriate to exclusively apply either a Hong Kong or US management style.

### 3.3.3 IS careers from an IS personnel perspective

A further focus of research in the IS career literature has been associated with the career options and choices of IS personnel. Broadly, this encompasses two interrelated areas - career opportunities and career orientations. Examples of IS literature focussed in these perspectives will be presented in the following section.

#### *3.3.3.1 Career opportunities:*

Three studies directly related to the career prospects within the IS industry will be examined. These are the work of Chesebrough and Davis (Chesebrough & Davis 1983); Applegate and Elam (Applegate & Elam 1992) and Igbaria and Greenhaus (Igbaria & Greenhaus 1992a).

The first two supported a view of the limited career opportunities for IS personnel while the third questions whether, in fact, the career prospects for this group of workers were actually different from other work force sectors.

*Planning a career path in information systems*

The work of Chesebrough and Davis (Chesebrough & Davis 1983) focussed on the construction of a framework to aid the career planning of IS personnel. Initially they established a distinction between top-down and bottom-up approaches to career planning. Top-down was defined as one where there was an ultimate pre-established career objective. This necessitated tracing potential routes of career appointments that lead to the desired outcome. The bottom-up approach was said to involve looking at the range of career options available from the current position.

On this basis, it was proposed that IS professionals have three potential models of career advancement. These were defined as the pyramidal model, the dual ladder model and the career stage model. In the first, the career progressed through a series of different roles to potentially reach a ceiling at the managerial level. The major

criticism of this model was that it could prove problematic as many IS personnel would opt to maintain a strong technical orientation and would not wish to make the change to management. The second, dual ladder, model assumed that both technical and managerial paths were followed as a parallel process. In this, the major difficulty perceived was that multiple career tracks were said to often offer only limited, short term, career movement.

The career stage model was based on the work of Dalton (Dalton 1989) which has been reported in the developmental career theories in the previous chapter. It was identified as relating specifically to the stages within a professional career. Based on the proposed career models, Chesebrough and Davis (Chesebrough & Davis 1983) recommended that the last model, the career stage approach, was the most appropriate for IS careers, in particular because the IS industry was seen as in a stage of transition working towards establishing professional accreditation.

*New Information Systems Leaders: A changing role in a changing world*

Applegate and Elam (Applegate & Elam 1992) identified a trend for decreasing opportunities for IS personnel to rise through the ranks in an organisation into IS management. This was based on the perception of a growing practice to not only fill these top level vacancies through outside recruitment, but also to favour broader management skills above extensive IS experience. As a consequence, this often precluded IS personnel from the opportunity to achieve a long term career objective in management.

The research was based on a questionnaire distributed to a total of 137 IS executives. The data were divided into two groups: defined either as established or recent entrants to the appointment. The first described people holding appointments at this level in excess of a five year period, whereas recent appointments differentiated those with less than 5 years in this role.

The results showed that the most recent IS executives largely focussed on IT strategic planning and control, IT architecture management and standards development, and human resource management. Those with more long-standing experience, however, tended to be mainly concerned with IT architecture management and standards development, human resource management and operations.

From these findings the main recommendations were it was imperative that:

- senior IS executives widened their skill base;
- career development strategies ensured that IS personnel had sufficient exposure to broader managerial and business issues;
- graduate and executive programs, aimed at the preparation of future IS managers and leaders, also needed to cater for business and IT competencies.

*The career advancement prospects of managers and professionals*

The study of Igbaria and Greenhaus (Igbaria & Greenhaus 1992a) was motivated by questioning whether, in fact, MIS employees were unique with respect to the career

advancement of managers and professionals. Consequently, the aim of their research was to examine differences in the career advancement opportunities for MIS and non-MIS personnel. Based on this data, it was proposed to develop a model of the antecedents and outcomes of career advancement for these two groups.

The model was based on the premise that job performance evaluations would lead to three potential outcomes related to career advancement. These were:

- self-perceived advancement (how the individual construed their chances of advancement);
- promotability (how an individual was seen as being worthy of promotion);
- career plateau status (based on performance whether the career had reached a plateau in the organisation).

The model also proposed that perceived career advancement prospects influenced both job and career satisfaction and in turn, organisational commitment.

The data applied in this research were drawn from a larger research project. Within this, a questionnaire was administered to 531 employees from a communications company where, proportionally, there was greater number of MIS employees. To add a further dimension in the research, individual supervisors of these workers were also involved.

The results from this sampling revealed a number of findings. In summary these showed that:

- MIS employees were more likely to have reached a plateau in their careers than their non-IS counterparts;
- job satisfaction was positively associated with self-perceived promotion advancement opportunities and promotability;
- there was a negative correlation between perception of a career plateau and job satisfaction;
- contrary to the predictive model, job performance had a direct effect on job satisfaction;
- career satisfaction was predictive of job satisfaction, although career plateau status and self-perceived advancement opportunities were stronger for MIS professionals than for MIS managers;
- contrary to the model, job performance had a direct effect on career satisfaction and, in this case, the effect was stronger for MIS managers.

Based on the results, these researchers made a number of recommendations for management. Most importantly, the research was seen as demonstrating that MIS employees were not exceptions in relation to career advancement experiences. It was also essential that managers were aware of the dynamics behind career advancement for employees engaged in this area. Managers were urged to bear in mind that the relationship of job performance was crucial for MIS managers. High performance ratings for this group reduced the likelihood of reaching a career plateau, thus reducing negative outcomes for job and career satisfaction, and, in turn, organisational commitment. Further, because senior MIS managers were more likely

to have reached a career plateau, it was essential these employees were provided with special attention in the form of training, development and, even job design.

### *3.3.3.2 The career anchors/ orientations of IS personnel*

This area of IS career research is significant because it obviously had its roots in the work of Schein (Schein 1978). Consequently, it demonstrated a reference to the broader career theory. The following authors provide examples of work in this area: Igbaria, Greenhaus and Parasuraman (Igbaria, Greenhaus & Parasuraman 1991); Crook Crepeau and McMurtrey (Crook, Crepeau & McMurtrey 1991); Crepeau, Crook, Goslar and McMurtrey (Crepeau *et al.* 1992); Ginzberg and Baroudi (Ginzberg & Baroudi 1992); Jiang, Klein and Balloun (Jiang, Klein & Balloun 1995) and Crook and Crepeau (Crook & Crepeau 1997).

*The career anchors of IS managers and professionals*

Igbaria, Greenhaus and Parasuraman (Igbaria, Greenhaus & Parasuraman 1991) reported research where the aim was to correlate the career anchors of IS managers and professionals and their relationship to selected demographic characteristics, job type and career outcomes. It was based on a questionnaire administered to over 2500 members of the ACM (the Association for Computing Machinery association) to gather data in relation to demographic data, career orientations and career outcomes. Career outcomes were defined as encompassing a number of areas, namely:

- satisfaction;
- organisational commitment;
- intention to leave;
- perceived job characteristics (based on task rewards and organisational rewards and boundary spanning activities).

The results, based on a response rate of 18.2%, supported the hypothesis that, in this sample, the prevalent career orientations would be technically or managerially based. A second goal of this research was to determine any relationship between career orientation and job setting. This portion of the results demonstrated a significant association between systems programmers and a technical, or autonomic, orientation. Further, for programmers and software engineers, while the primary orientation to technology remained, these groups had autonomic or managerial directions. In addition, while autonomy and lifestyle were also moderately represented, this was more so among female respondents. From a managerial perspective, autonomy and lifestyle were shown to more likely to be associated with management, systems analyst and project leadership. Consultants emerged as the positional group more likely to have held hybrid career orientations, which involved a mix between technical and managerial involvement.

The third focus in this study was to examine the influence of a match between job setting and career orientation to determine positive or negative perceptions of job, career and organisational commitment. While overall this prediction was confirmed, there was a slight variation between managerial and technical employees. Both groups reported high job and career satisfaction, but those defined as technical staff showed less organisational commitment and intention to remain in the position. This difference was not, however, demonstrated to be statistically significant.

*Career anchors as a tool guiding managerial and employee career decisions*

Crook, Crepeau and McMurtrey (Crook, Crepeau & McMurtrey 1991) proposed that career anchor/orientations could be usefully applied as a tool to guide managers and employees in their career decisions. To test this proposition, three research questions were posed. The first aimed to determine whether career anchors exist that discriminate the different IS job types. The second followed from the first question, and considered any change in outcome on the basis of gender. The objective of the third research question was to examine whether, of the anchors shown to have discriminatory power, these would change dependent on time in the labour force. Following Schein (Schein 1978) this was defined as encompassing up to five years employment experience in an organisation.

The research involved the administration of the Careers Orientation Inventory (based on DeLong, 1982) to 580 DP/MIS employees. Based on 321 returns, the major finding was that career anchors could, although only marginally, distinguish between IS employees, by job type and sex. It was emphasised that the strength of the distinction, at the very best, was weak. The anchors that failed to discriminate job type (autonomy, identity, organisation security) lead these authors to suggest that regardless of role, IS personnel valued independence of action, status within the organisation and a stable career.

Similarly, from a gender perspective, the failure of anchors to discriminate in some areas was seen to have provided evidence that supported stable careers. A stable career with the firm (organisation security), helping others (service) and a wide range of job challenge (variety) were anchors equally identified within this sample population.

The results for the third research question, which focussed on the discriminatory power of career anchors over time, did show different outcomes. More specifically, those with greater than five years experience tended to be generally oriented towards technical competence, managerial competence and geographical security. That is, there was commonly a high regard for challenge, problem solving and remaining in employment in a single geographical location.

The main recommendation from this research was that when IS managers did apply career anchors, it would be more meaningful to focus on those that failed to discriminate. This implied, autonomy, identity and organisational security.

*The wide scope of career anchors among IS personnel*

Crepeau, Crook, Goslar and McMurtrey (Crepeau *et al.* 1992) provided a second report based on the previous research (Crook, Crepeau & McMurtrey 1991). This new focussed on an investigation of the career orientations of IS personnel on the premise that, while IS personnel would hold a wide variety of career orientations, the majority would be either managerial or technical.

With one exception, the results confirmed that IS personnel did have a wide variety of career anchors. Creativity was the single anchor that failed to conform with this finding. The results showed a clear distinction between security and stability, which in some research had been used as a single anchor. This finding was seen as important because security implied a geographical anchor, whereas stability referred

to an organisationally based orientation. This research was proposed by these researchers to be a catalyst for future research.

*An examination of the career orientation of IS personnel in organisational and geographical settings*

Ginzberg and Baroudi (Ginzberg & Baroudi 1992) examined the career orientations of IS personnel in a number of different organisational and geographical settings. This study was founded on the proposition that IS personnel would hold a diversity of career orientations to an extent that, managerial and technical competencies, would not emerge as dominant. In keeping with this assumption these researchers tested geographical and organisational variables. They followed Schein (Schein 1978) in that anchors were dynamic and would therefore need to be subjected to redundancy, and new replacement ones would need to be added. Consequently, this research was based on 11 anchors: management, entrepreneurial, creativity, challenge, job security, autonomy, technology, organisational identity, geographical security, service and lifestyle integration. The last career anchor was a recent addition, being based on a balance between work, family and personal activities.

This revised instrument was distributed to 585 IS personnel, employed by four very large corporations having central and regional operations in a range of geographical locations. The primary business interests of these organisations were in oil, insurance and manufacturing.

The results were based on 394 responses and confirmed the wide diversity of anchors, with neither managerial or technical competencies emerging as dominant. In relation to organisation and geographical influences, these were shown to be of little influence. The consistency in the findings was such that there was only one exception across the subsets of data, with the same top three and bottom three career anchors being repeated. Challenge, service and job security represented dominant anchors, while the less influential anchors were entrepreneurship, organisation identity and technical competence. As a result of this research, a universal approach to career management and planning was seen as being appropriate.

*The effect of external conditions in determining career orientations*

While Jiang, Klein and Balloun (Jiang, Klein & Balloun 1995) supported that IS personnel did have a diversity of career anchors, they also contended that career orientations could vary, dependent on external conditions. The objectives of this research, therefore, were to confirm that IS personnel held a wide variety of career orientations (not dominated by managerial and technical competence) and to demonstrate that situational factors were highly influential in determining anchors. The situational factors in this study involved focussing on an organisation in financial stress.

The research was sited in an international computer manufacturing company and targetted IS personnel engaged as systems analysts, programmers or technical support personnel. An instrument, using a Likert Scaling approach focussed on 36 career anchor statements, was distributed to 121 employees. Likert scaling is based on an a priori scale (e.g., 7 points) which is applied to obtain the average and standard deviations of the results obtained (Schmitt & Klimoski 1991). While there were 101 responses, the results reported in this study focussed on the 59 employees

who reported 1 to 5 years experience. As already established this period is the critical time span during which career anchors were said to emerge (Schein 1981). The findings of this study supported the proposition that IS personnel held a diversity of career orientations. Managerial and technical competence did not emerge as dominant anchors, which lead to uncertainty regarding the dual career concept often proposed in IS career research. The anchor that emerged as dominant was that of organisational stability. This was seen to have demonstrated the potential impact of external forces during the development of career patterns and, as such, had implications for future IS career research.

*A comparison of the career orientations between students and professionals*

Crook and Crepeau (Crook & Crepeau 1997) compared the career orientation of information students and professionals. Within this study the Career Orientation Inventory developed by Delong (DeLong 1982) was administered to 292 IS professionals employed in twelve US companies, as well as 63 junior and senior IS major students. The instrument was an extension of the work of Schein (Schein 1978) and involved a further 3 anchors defined as identity, service and variety. In this study, unlike the interview technique approach applied in the original research of Schein (Schein 1978), a survey instrument was administered.

The results showed statistical differences between the career anchors of students and professionals in relation to autonomy, identity, managerial competence, service, technical and variety. Apart from identity, the mean value for these variables was higher within the student group. While the stability of anchors over time was questioned, the research did not acknowledge that part of the sample involved IS major students. Given that Schein (Schein 1978) defined careers anchors as developing over the initial first three to five years in a career, it would appear that data from this second group represented an inappropriate sample in this research.

### 3.3.4 Motivation

Motivation has been identified as being the primary focus within IS career research (Crepeau *et al.* 1992), where much of the work reported shares a common basis in the job redesign work of Hackman and Oldham (Hackman & Oldham 1980). While this model has been extensively applied, both in broader career research and that dedicated to IS personnel, it is not without its critics. In particular, from an IS research perspective, Sein and Bostrom (Sein & Bostrom 1991) challenged that its factor structure could, in fact, vary dependent on profession and other job related factors.

At the broadest level, career motivation theory is defined as encompassing career and work behaviours extending from job search and acceptance, career planning and career adjustments through to the means of achieving of career goals (London 1993). In an occupational sense motivation stems from either external or internal influences, which can interact to determine the extent and direction of affective outcomes from the work experience of the individual (Westerman & Donaghue 1989). Extrinsic motivation is said to come from the contextual environment in an organisation, in particular the nature of work and reward systems. Intrinsic motivation has as its basis, inherent needs and satisfiers for the individual (LeDuc 1980) which, when fulfilled, result in positive internal experiences and effective performance within a job (Oldham 1976). However, at the same time:

> Motivation is a very difficult concept to observe directly because it is a hypothetical construct. Our motives can only be inferred on the basis of behaviour. But motivation and job performance are not synonymous. Performance is influenced by many factors -skill, ability and working conditions - not just motivation (Westerman & Donaghue 1989:80).

The IS orientation to motivation can be explained as stemming from the seminal work of Couger and Zawacki (Couger & Zawacki 1978); (Couger & Zawacki 1980), which has provided the basis of a considerable body of IS career research dedicated to the topic. For example, Couger and Zawacki (Couger & Zawacki 1978); (Couger & Zawacki 1981); Dengate, Couger and Weber (Dengate, Couger & Weber 1990); Burn, Couger and Ma (Burn, Couger & Ma 1992) and Couger and O'Callaghan (Couger & Callaghan 1994).

#### *3.3.4.1 Factors motivating IS personnel*

The work of Couger and Zawacki (Couger & Zawacki 1978) (Couger & Zawacki 1980) was based on the premise that IS personnel were different. This research applied the Job Diagnostic Survey model (JDS) from Hackman and Oldham (Hackman & Oldham 1980) appropriately modified for use with DP professionals (JDS/DP). The model proposed that five core job dimensions, skill variety, task identity, autonomy and feedback lead to three critical psychological states. These were defined as the experience of meaningfulness of the work, responsibility for the outcomes of the work and the knowledge of the actual results of the work. In turn, the outcome of the achievement of a healthy critical psychological state was seen as resulting in high internal work motivation, high quality work performance, high job satisfaction, low absenteeism and turnover (Oldham 1976). The factors making up the outcome side of this model provided evidence that a majority of IS personnel career research shared a commonality based on a foundation in motivation.

The main conclusion from Couger and Zawacki (Couger & Zawacki 1978) was that DP professionals were different from the general labour force in that, based on a sample population of 600 DP professionals (analysts, analyst/programmers and programmers), they exhibited significantly lower social need strength. This has been defined as meaning the strength of an individual's need to interact with others. For this group it was found to be startlingly low to the extent of having an almost negligible need to work with others. Secondly, they were also shown to possess a higher than normal growth need strength (GNS). Within this model this implied a greater need for job challenge as compared with workers in other occupations.

#### *3.3.4.2 Motivating Australian IS personnel; Hong Kong IS personnel; comparing the motivation of Spanish and Finnish IS personnel*

The original work of Couger and Zawacki (Couger & Zawacki 1978) was extended to study, and then compare, the motivational characteristics of computing personnel in Australia (Dengate, Couger & Weber 1990), Hong Kong (Burn, Couger & Ma 1992) and, most recently, Finland and Spain (Couger & Callaghan 1994). The results of this cross cultural comparisons generally confirmed a similarity in motivation between these three locations. In the case of Hong Kong, however, a significant mismatch was identified in the motivational potential of the jobs currently held by IS professionals employed in that country.

### 3.3.5 Job satisfaction, role stressors, turnover and commitment

In Chapter Two, it was established that Staw (Staw 1984), on the basis of a major review of the micro perspective in organisational behaviour, identified job satisfaction role stressors, turnover and commitment as variables most frequently addressed in industrial psychology. These have also often been applied in IS personnel research, where there is considerable overlap between each of these perspectives. The underlying theme in much of this research can reasonably be linked with the perception of above average positional mobility in the IS labour force (Igbaria & Siegel 1992).

> Boundary spanning, role conflict, and role ambiguity {within this review defined as role stressors} have all been found to be important antecedents of commitment, job satisfaction and turnover (Baroudi 1985:341-342).

In this section, examples of IS career research that encompasses up to all four of these four variables will be considered. These are studies by Baroudi (Baroudi 1985); Igbaria and Greenhaus (Igbaria & Greenhaus 1991); Igbaria and Guimaraes (Igbaria & Guimaraes 1992); Igbaria and Siegel (Igbaria & Siegel 1992); Igbaria and Greenhaus (Igbaria & Greenhaus 1992b); Guimaraes and Igbaria (Guimaraes & Igbaria 1992); Goldstein and Rockart (Goldstein & Rockart 1984) and Igbaria and Siegel (Igbaria, Parasuraman & Badawy 1994).

#### *3.3.5.1 Impact of role variables on work attitude and involvement*

Baroudi (Baroudi 1985) examined the antecedents of job satisfaction, commitment, and turnover intentions. Based on centralised IS groups drawn from nine US companies, the 229 participants represented application programmers, programmer/analysts, and project leaders. Data collection were based on the administration of a questionnaire. The results showed role ambiguity to be the most dysfunctional influence within this sample population. At the same time, the fact that many IS professionals were engaged in boundary spanning activities was said to be partially responsible for this outcome. Consequently, based on this research managers were urged to identify issues that could give rise to role ambiguity.

#### *3.3.5.2 Work attitudes*

The considerable research reported by Igbaria in this area has been based on the administration of a wide ranging career attitude survey to members of the DPMA (Data Processing Management Association) (Igbaria & Greenhaus 1991), the ACM (the American Computer Machinery association) (Igbaria & Greenhaus 1992b); (Igbaria & Siegel 1992), and IC (Information Centre), IS employees within organisations (Igbaria, Parasuraman & Badawy 1994); (Igbaria & Guimaraes 1992).

In the earliest of these studies Igbaria and Greenhaus (Igbaria & Greenhaus 1991) examined the job characteristics, job involvement, job satisfaction, career satisfaction, organisational commitment, professionalism, boundary spanning activities, promotability and intention to stay for 328 DPMA members. The results showed that these employees recorded a strong intention to stay with their existing employer, a high organisational commitment, career satisfaction and job satisfaction. However, they also experienced low job involvement and received little in the way of tangible rewards for their efforts. The recommendations from this research

reflected those made by Baroudi (Baroudi 1985) which highlighted the importance of minimising the adverse influence of role ambiguity and role conflict.

#### *3.3.5.3 Antecedents of job satisfaction, reasons for turnover*

Two further studies reported by Igbaria and Greenhaus (Igbaria & Greenhaus 1992b) and Igbaria and Siegel (Igbaria & Siegel 1992) followed a similar focus involving all four variables, but this time targetted members of the ACM. A questionnaire mailed to 2548 members of this organisation achieved a response rate of 20.3%. The representativeness of this sample was confirmed by testing the demographic characteristics of respondents with the wider ACM membership. In this research the application of job satisfaction, role stressors, commitment and turnover variables was extended to also included those related to a career. These were defined as salary, promotability and career opportunities. The results showed that the most immediate determinants of turnover intentions were job satisfaction and organisational commitment. Further determinants of turnover included the age and educational level of IS employees, role stress and career experiences. In relation to age and education it was demonstrated that young, highly educated IS workers were more susceptible to high mobility.

The final example of IS career research that combined all four variables was based on a study that compared whether the outcome differed between IS and information centre (IC) personnel. IC refers to IS personnel whose main duties involved the management and support of end user computing, an area that evolved due to the expansion of micro computing in organisations. The research involved 38 US companies who had significant IC operations extending over a least a 5 year period. Within this research, responses were received from 209 employees engaged in either IS or IC roles. The results showed that job satisfaction was the primary motivator for both these employee groups. However, while for IC employees job satisfaction was shown to have a direct influence on commitment and organisational mobility, this was not the case among the IS group.

#### *3.3.5.4 Work correlates of job satisfaction among analyst/programmers*

Goldstein and Rockart (Goldstein & Rockart 1984) examined job satisfaction based on the relationship between role conflict, role ambiguity and quality of leadership. The inclusion of these three variables was seen as extending the work of Couger and Zawacki (Couger & Zawacki 1980). A questionnaire was personally administered to 125 analysts and programmers from four large organisations, each having in excess of 100 staff engaged in these appointments. The results, based on an adjusted sample of 118 respondents, supported the hypotheses that both leadership and role perceptions were important determinants of job satisfaction. This finding was seen as demonstrating that these variables were necessary to gain a better understanding into the work correlates of job satisfaction among IS personnel.

#### *3.3.5.5 Work experience, job satisfaction and quality of worklife*

Igbaria, Parasuraman and Badawy (Igbaria, Parasuraman & Badawy 1994) reported a further aspect on data obtained from a questionnaire survey of ACM members (Igbaria & Greenhaus 1992b); (Igbaria & Siegel 1992). Here the focus was on job satisfaction and the quality of working life among IS personnel based on role involvement and organisational commitment. The findings indicated that involvement acted as a complex moderator in the pattern of relationships of work

experiences, and of job characteristics with career expectations and outcomes. While high levels of involvement were beneficial, in some situations it was found this could also heighten the negative influences of role stressors.

### 3.3.6 A summary of IS career research from an organisational behavioural perspective

The scope of the examples of IS career research from an organisational behavioural perspective closely reflects that presented in the broader career research in Chapter Two.

This review has demonstrated a considerable overlap in the issues addressed and the research approaches used. Much of this research is narrow in focus, the same variables have often been applied and overall the approach has been ad hoc. Consequently, the recommendation of Van Sell, Brief and Schuler (Van Sell, Brief & Schuler 1981) for the establishment of a framework to guide future research could equally be levelled at IS career research.

Cross sectional, one-shot samplings based on questionnaires are the most frequently used technique for data collection. In some studies multiple sources of data have been applied, for example, Turner and Baroudi (Turner & Baroudi 1986). Comparative analysis, based on differentiating IS roles, positional status, gender, IS and non-IS industry sectors are also accepted research practices.

There is also some evidence of direct references to career theory. For example, Chesebrough and Davis (Chesebrough & Davis 1983); Ginzberg and Baroudi (Ginzberg & Baroudi 1988) and the studies based in career anchors (Igbaria, Greenhaus & Parasuraman 1991); (Crook, Crepeau & McMurtrey 1991); (Crepeau *et al.* 1992); (Ginzberg & Baroudi 1992); (Jiang, Klein & Balloun 1995); (Crook & Crepeau 1997).

From an OB perspective in IS career research, mobility has emerged as a major concern for management. To a lesser extent, and related to mobility, the career opportunities or the lack of them for IS personnel have also attracted management attention.

A major difference between the research reviewed in this section and the related research in the previous chapter can be attributed as specific to the IS industry. A considerable amount of the research has been constructed as a guide for management when dealing with the IS human resource. Importantly, this has been extended to consider the effects of the global economy on management practices (Burn, Ma & Tye 1995).

Generally, this in this research there is some disagreement as to whether IS personnel can be defined as a unique sector of the labour force (Ferratt & Short 1988); (Turner & Baroudi 1986); (Igbaria & Greenhaus 1992a).

## 3.4 Examples of more comprehensive IS career research

In the second stream of IS career research there were only limited examples of work that attempts to deal with a career in a wider context. There was, however, one exception: the seminal research reported by McLean, Smits and Tanner (McLean,

Smits & Tanner 1996). Apart from this work, the remaining research has been less reflective of the notion of a career and the wider issues it potentially encompassed. These examples were the work of Tanniru (Tanniru 1983); Richards and Sanford (Richards & Sanford 1991); Beise, Padgett and Ganoe (Beise, Padgett & Ganoe 1992) and Wagner (Wagner & Benham 1993).

Because of the significance of the work of McLean, Smits and Tanner (McLean, Smits & Tanner 1996) it will be considered in some detail to conclude this chapter.

**Table 3.3: A comparative summary of general IS career research**

| Criteria | Tanniru (1983) | Richards (1991) | Beise, Padgett & Ganoe (1992) | Wagner & Benham (1993) |
|---|---|---|---|---|
| **Reason** | descriptive | descriptive | descriptive | descriptive |
| **Use** | basic | basic | basic | basic |
| **Time** | cross sectional | cross sectional | cross sectional | longitudinal |
| **Technique** | quantitative - questionnaire & follow up interviews | quantitative- questionnaire | quantitative - questionnaire | NLS 72 data follow up interviews |
| **Objective** | observe career paths: positional change & duration of first appointment | determine effectiveness of IS education | curriculum development | determine factors effecting tenure |
| **Sample population** | DP professional association members (DPMA and ACM) | IS graduates | IS graduates | high school seniors |

### 3.4.1 An investigation of the career path of the EDP professional

One of the original examples of DP career path investigations was undertaken by Tanniru (Tanniru 1983). To recap, the terms DP and EDP are more reflective of the earlier purposes of computer technology - data processing and electronic data processing. The basis of this research was a perception that most organisations failed to provide career planning for their DP personnel. The objective was to observe the career paths spanning a 10 to 20 year period and to compare the results with 4 proposed paths:

1. Operating personnel → operations manager
2. Systems programmer → systems manager → internal consultant
3. Programmer/ programmer analyst → systems analyst → applications manager → MIS director
4. Other positions → internal consultant/ specialist → other position.

Three further issues were also examined in this study. Firstly, the background of those pursuing data processing careers. Secondly, the frequency with which these personnel changed their positions and the positions where change most frequently occurred. Thirdly, the duration of the initial appointment and whether the move out of this position implied career movement within the same organisation or change to a new employer organisation.

As outlined in Table 3.3, this study was based on a the administration of a cross sectional questionnaire and two follow up interviews conducted at 3 and 6 month intervals, following the initial data collection. Representing a 30% response rate, returns were received 145 members of two professional associations for DP personnel: the DPMA and the ACM. These included 'mostly' people working in analyst, programmer, manager and specialist positions.

The main findings were support for the career path beginning with the programmer/programmer appointment, partial support for the one starting out as a systems programmer and no support for the operations personnel path. The fourth path tested was found to be based on either those moving out of systems or applications path or as an entry point for non DP personnel. Further, there was little difference over time in these results before and after the 1960s.

Reflecting that this study predated to some extent, the availability of specific tertiary qualifications, the majority of people engaged as DP professionals participating in this research came from scientific or teaching backgrounds. A further finding was that most initial positional appointments involved a two year period, although over time the extent of the data this described reduced by 20%. Finally, in relation to organisational movement, the finding was that mostly this involved a move away from the original employer. It was suggested that this was driven by the limited availability of defined career paths for DP professionals, which necessitated that they were constantly forced to explore all career options available to them.

### 3.4.2 IS career research from an educational perspective

The majority of more comprehensive IS career research has been motivated from an educational perspective. The objective underlying this approach was to obtain feedback to assist in the development of teaching programs aligned with the industry requirements in the face of ever developing technologies. Three examples involved the work of Richards and Sandford (Richards & Sanford 1991), Beise, Padgett and Ganoe (Beise, Padgett & Ganoe 1991); (Beise, Padgett & Ganoe 1992) and Wagner and Benham (Wagner & Benham 1992).

#### *3.4.2.1 Tracking the Career Paths of Information Systems Professionals: Results of a Survey of University of North Texas IS Graduates*

One of the stated aims within the research conducted by Richards and Sandford (Richards & Sanford 1991) was to develop a formal instrument to determine the effectiveness of IS education, both from objective and subjective perspectives. The basis of this research was a perceived need for educators to be kept up to date with market and industry demand for IS graduates.

The study involved a cross sectional sampling of over 700 graduates from the University of Texas, who had gained a major in IS from the Department of Business Computer Information Systems. Areas of focus included the first position, current position (if different), primary software tool, primary hardware platform and characterisation of position.

Data were collected from 100 graduates (an approximate response rate of 14%) with the majority of respondents being those who gained their awards between 1983 -

1990. Consequently, the results were based on a period which describes up to 7 years industry experience.

The results showed that 61% of initial appointments involved positions either as programmers (43%) or system analysts (18%). While 68% of participants reported having left their initial position, no indication of how this related to duration of employment was given. Some areas of the results presented in this research are now dated, but still serve to reinforce the changing nature of the industry. For example, in this study, during their initial appointment, a majority of these graduates were involved with COBOL (59%), and mainframes (64%). There was also a trend for graduates to move to mini and micro computers as their careers matured. An unexpected finding was that less than half (44%) had any exposure to databases when engaged in this first appointment. These results were taken to be indicative of a need for teaching in the area of IMS/DB2, networks and case tools. The emerging importance of graphical user interfaces (GUI ) was also pointed out.

Position characterisation was an attempt to classify the focus area of their first and currently held position (if different). Three areas were proposed: as an IS professional creating software; a user of computing technology or a facilitator for another user. From these results these authors identified a clear trend with a move away from software development to the other two areas in subsequent positions which was the case for 55% of the graduates involved.

#### 3.4.2.2 Information Systems Graduates: What are they really doing?

To some extent the work of Beise (Beise, Padgett & Ganoe 1991); (Beise, Padgett & Ganoe 1992) followed through on the earlier findings of Richards and Sanford (Richards & Sanford 1991), as the rapid pace of change was seen as likely to have affected the skills IS personnel required. Beise, Padgett and Ganoe (Beise, Padgett & Ganoe 1991) sought to find if the then present work of graduates reflected current and predicted changes in the IS field. At the same time the objective was to obtain feedback to guide development for the more recent IS curriculum.

Within this research a questionnaire was administered to 5810 graduates representing 126 schools across the United States offering IS programs. The aim of this cross sectional sampling was to gather data specifically in relation to the work graduates were engaged in, and any newly evolving job types. The results showed that a majority of graduates were involved as systems analysts, programmers or in end user support. Within these positional roles, the outcome for programming was defined into one of three categories: third generation languages (3GLs), systems and fourth generation languages (4GLs). Of these the majority of activity was shown to be in 3GLs, followed by systems and lastly 4GLs.

When the results for programmers, systems analysts, end user support personnel and task were cross referenced, this showed that the three main activities for programmers (in addition to programming) were problem solving, analysing systems and interfacing with users. System analysts reported interfacing with users as their second activity followed by problem solving and documentation of systems. Those engaged in end user support were more involved with assisting customers, problem solving and analysing systems.

The division of the data, which spanned 1990 to 1984 and before, into three graduation cohorts, showed that recent graduates were more likely to be programmers, and those in the earlier groups to have been system analysts and managers. In addition, the emergence of end user support as a formal IS position was acknowledged.

#### 3.4.2.3 Career Paths in IS: A Longitudinal Analysis

The stated focus of the longitudinal career path research of Wagner and Benham (Wagner & Benham 1992); (Wagner & Benham 1993) was to identify the factors that influenced the tenure of IS professionals. Within this study data are drawn from the National Longitudinal Study of the High School Class of 1972 (NLS-72). This provided details of the characteristics and work experiences representing approximately 25,000 high school seniors. Further to the initial interview in 1972, follow up interviews were conducted in 1974, 1976, 1979 and 1984 when 12,841 respondents remained involved. From this coding of this data 405 people were identified as being employed an IS professional capacity at some time during the 14 year sample period. For the purposes of this research the coding scheme was limited to describe working as programmer, analyst or systems professional not otherwise classified.

The results show that wage level, starting age and college major were significant determinants of the tenure of IS professionals. Further, while the tenure was found to be short (approximately 3 years) when using simple summary statistics, when right censoring was applied the average tenure increases significantly to 12.8 years. An explanation of right censoring will be provided in Chapter Three during a brief introductory outline of event history analysis.

An unexpected recommendation from this research was to advise IS managers to attract high school leavers by paying them a high initial salary. This was despite the fact that 162 of the sample working as IS professionals had gained bachelor awards and a further 39 held post graduate qualifications. Even further, although computer science was established in the US curriculum during the time frame targetted in the research (1972-1986), IS managers were advised to select mathematics major graduates.

### 3.4.3 The seminal work of McLean, Smits and Tanner

As stated earlier, the longitudinal research of McLean, Smits and Tanner (Smits, McLean & Tanner 1997) has been the most comprehensive study of career research focussing on IS professionals reported in the IS literature. In all by 1997, aspects of this research had been published in 14 refereed proceedings and journal articles (Smits, McLean & Tanner 1997). The study, which began in 1987, extended over an 8 year period and involved three samplings. In addition, qualitative data were gathered through interviews conducted with IS managers and executives during 1992 to 1994.

Table 3.4 provides a comparative summary of the areas of focus within each of the three phases of data collection (Smits, McLean & Tanner 1997). This summary allows the reader to clearly establish the areas where repeated measure samplings were involved. It also provides an insight into how the themes developed to represent the differing stages in a career. In particular, this refers to pre-entry, post entry and, a

second follow-up after longer exposure to employment in the IS industry. The final row in Table 3.4 indicates that an open approach within each stage of sampling provided the opportunity for respondents, within each phase, to offer open, personal feedback.

**Table 3.4: A summary of each phase in the research**

| Pre graduation survey | Post-graduation follow up 1 | Post-graduation follow up 2 |
|---|---|---|
| personal demographics | | |
| academic demographics | academic information | academic information |
| job search activities | | |
| career certainty | career certainty | |
| job preference inventory | present job characteristics | |
| personal characteristics inventory | | |
| | employment demographics | employment demographics |
| | job and career attitudes | |
| | | organisational commitment |
| | | vocational development scale |
| | | career progression scale |
| one or more items soliciting open ended statements relating to career entry, adjustment and/or progress | | |

*Pre graduation survey*

The defined objective in this initial survey was to construct a conceptual model of career preparation and entry. Apart from the demographic aspects, a questionnaire was developed with reference to established instruments from organisational behaviour and psychology. This was then administered to 1018 IS students, a majority of whom were nearing the completion of their undergraduate study representing 38 colleges and universities offering IS degree programs in the United States. A small proportion had very recently been awarded bachelor degrees. This sampling predominantly involved young males, a situation not uncommon in IS tertiary education and also indeed reflected in the IS labour force (Compeau, Higgins & Huff 1998).

The results indicated that, at the pre entry career stage, graduates showed a great diversity in how they perceive themselves and also the job characteristics they saw as important. However, a number of patterns were also seen as emerging and these were related to the extent of career certainty, gender, IS degree graduates, age and academic achievement. In particular:

- high career certainty was found to be positively associated with:
  - confidence in perceived capability
  - leadership
  - intention
  - developed work ethic
  - adaptability
  - persistence
  - enthusiasm
  - independence
  - less concern for advancement into functional areas and management

- males respondents were more likely than female respondents to possess:
  - higher perceived capability and adaptability
  - lower interpersonal capacity

- lower developed work ethic
- lower importance on interpersonal work environment
- lower concern about autonomy

- IS degree graduates placed greater importance on:
  - interpersonal capacity
  - attention to appearance
  - stated desire for advancement
  - concern for salary, benefits, security in work environment,
  - interpersonal work environment
  - autonomy

( They do however, have less concern about motivating factors in the work environment)

- younger age graduates were found to possess:
  - lower self perceived general capacity
  - more interpersonal capacity
  - more attention to appearance
  - more stated desire for advancement
  - more importance on interpersonal work environment
  - more concern for autonomy

- lower academic achievement graduates exhibited:
  - lower self perceived general capability
  - more interpersonal capacity
  - more attentive to appearance
  - more stated desire for advancement
  - more concern about autonomy (McLean, Tanner & Smits 1991)

*Post-graduation follow up survey 1*

A second round survey was conducted twenty two months after the initial data collection. This was seen as representing the point in a career where there was sufficient career experience to compare initial expectations and the realities of actual work force experience. This survey was administered to graduates who had participated in the initial survey. The focus of this questionnaire has been summarised earlier in Table 3.4, which indicates that three measures from the previous survey were repeated: demographics, present job characteristics and career certainty. Validated instruments, drawn from the wider career literature, were again incorporated into the questionnaire. This time, however, the focus was now reflective of the issues at this stage in a career, implying job and career attitudes.

The results from this first post-graduation follow up were based on a response rate of 41% of those completing the initial questionnaire. One of the major findings was the 'reality shock' experienced by a large number of these graduates. Two potential reasons were proposed as contributing to this outcome. Firstly, unrealistic expectations on the part of the graduates and secondly, the characteristics of IS positions. A comparison of this result and those from job preferences taken from the earlier survey, revealed a large number of negative discrepancies. In particular, based on actual experience many graduates felt that they had not been:

- fairly treated and evaluated;
- provided with a sense of accomplishment;
- paid an above average income;
- received encouraging performance feedback;
- given the opportunity to have an impact on the overall organisation;
- offered creative and challenging tasks;
- given opportunities for promotion within the IS field;
- given opportunities for promotion outside IS into general management;
- given opportunities outside IS in other functional fields;
- afforded job stability and security;
- exposed to state of the art equipment (Smits, McLean & Tanner 1997).

Reflective of these results, a further finding was a significant relationship ($P < .0001$) between job characteristic preference reality score discrepancies with subsequent job and career attitudes. In other words, negative work experiences similarly influenced unsatisfied attitudes to IS careers.

*Post-graduation follow up survey 2*

The final sampling in this longitudinal research was conducted 46 months after the initial survey. In this round a questionnaire was administered to the 326 graduates who had participated in the previous survey. The aim of this instrument was to gather data in the areas summarised in Table 3.4. On this occasion, two measures were repeated from the follow up survey 1. These were academic information and also employment demographics. In addition, new areas more relevant at this stage in a career were organisational commitment, and two scales: vocation development and career progression.

Based on a response rate of 54%, just over 90% of these respondents confirmed that they were still engaged in IS careers. The results from this phase in the research, focussed on the measures of vocational development plus career progression and the extent of any relationship between these with organisational commitment. Seven from the total of eight vocational development perspectives were shown to have positive, significant correlations with organisational commitment. These were:

- comparison of self to others as worker;
- personal reaction to work;
- work habits compared to others;
- relationship with co-workers;
- relationship with supervisors;
- clarity of career goals;
- career goals/personality and abilities fit (Smits, McLean & Tanner 1997).

The exception was having the skills and abilities for the job. While this measure was negative, it was not, however shown to be statistically significantly correlated with organisational commitment.

The results also showed that while, within the twelve career progression measures, three were shown as negative associations, only one proved to be statistically significant. The nine positive correlations were:

- detail/routine work on assigned projects;
- coordinating and integrating projects;
- responsible for aspects of long range planning;
- direct project/definable part of project;
- developing overall organisational strategy;
- project work overseen by more senior person;
- development of subordinates;
- activities that influence future direction;
- development of in-depth technical skills (Smits, McLean & Tanner 1997).

The negative outcomes were:

- go into depth in problem or technical area;
- rely on supervisor for resources;
- work under close supervision (Smits, McLean & Tanner 1997).

The researchers commented that if graduates were still experiencing little autonomy after 46 months work experience, then it was reasonable to expect that they would not have a strong commitment to that employer organisation.

One of the closing recommendations from this study was to encourage future longitudinal research in the topic. This research made an invaluable contribution to IS career research in providing a comprehensive summary of both the source and a number of validated instruments used during the course of the research. It also offered a list of references classified into specific areas such as career theory, compensation and benefits, cross-cultural work perceptions, employment turnover, IS personnel practices and issues, job entry and realistic job interviews and motivation. This has demonstrated a genuine concern to encourage research by providing a base collection of background information.

For academics, Smits, McLean and Tanner (Smits, McLean & Tanner 1997) recommended that topics worthy of further research were career certainty, career support systems, re-engineering IS jobs and career progression. Employer organisations were encouraged to provide realistic job interviews, improve human resource management and to encourage participation in management issues. Further, in relation to organisations, it was pointed out that commitment to an employer necessitated a good working relationship with supervisors and also involvement in setting strategic business goals. Finally, as a result of this research, IS personnel were urged to mentor new IS entrants and also to take a greater part in their own long term career planning.

## 3.5 Summary

At this point in the thesis, an examination of the limited available IS career research has provided an awareness of the issues and approaches commonly applied in the field. In particular, it has provided an insight to guide the direction and scope of the current study.

**General IS career research**

In relation to the less comprehensive IS career studies this review has:

- confirmed that the key underlying assumption in many of these studies has been a perception that IS personnel represent a special case for human resource management attention;
- determined that much of this research has been more generally conducted from an OB perspective;
- established a considerable focus has been directed to issues of motivation and mobility;
- revealed that the basis for some studies has been founded in the broader career theory, in particular, career anchors and job design research;
- established that cross sectional questionnaires have been the most commonly applied form of data collection;
- identified that sample populations have been largely based on people currently engaged in the IS industry, IS graduates or those in the final stages of an undergraduate IS degree.

**More comprehensive IS career research**
In summary, it is proposed that this section of the review has:

- confirmed the limited availability of more holistic IS career research: five examples spanning a ten year period;
- demonstrated that a majority of these studies were limited in focus and consequently only presented a narrow view of career outcomes for IS personnel;
- established that questionnaires were the most commonly applied instrument in IS career research and the wider application of a cross sectional approach;
- revealed that some areas of career theory have been used as the basis of IS career research;
- provided evidence of early concerns of the limited career path opportunities often experienced by IS personnel;
- highlighted the main risk in prospective longitudinal research: the loss initial respondents over time thereby creating an inability to compare outcomes over the entire career.

## 3.6 The implications of general career theory, research and IS career research in the context of the present study

At the beginning of this chapter, two outcomes were proposed. Firstly, to consolidate the approach used in this present research. Secondly, to establish a guide for future IS career research.

For the purposes of the research reported in this thesis, the preceding reviews of broader career research, and also those from an IS perspectives, offer guidance in establishing the approach to be applied in this present study. It is proposed that broadly these considerations can be defined as:

- theoretical background;
- perspective;
- scope;

- approach.

### 3.6.1 Theoretical background

This research is founded on an understanding of career theory, general career research and also IS career research. An examination of these three areas has indicated that there is no single appropriate approach to guide career research. The key issues that have emerged as of significance, are the need to acknowledge the dynamics of a career and also to direct attention to the earliest career experiences. In turn, this has provided a basis for the construction of the research questions to be addressed in this thesis.

### 3.6.2 Perspective

The establishment of a foundation of knowledge of career research has guided the decision to adopt a different stance in the present study. More generally, the review of the literature in relation to broader career research, and also IS career research, suggests that a majority of the studies reported have been taken from a management perspective. Such an approach does not support one of the objectives of this present study to provide a source of career information to a wide audience of readers. As a result, this research will examine a different view of a career, one based on the practical experiences of graduates over the course of their careers. As such, this research has adopted an original, and highly practical stance.

### 3.6.3 Approach

To acknowledge the career as a dynamic phenomenon has necessitated that the research is based on a longitudinal approach. Career theory supports this view in the move from a static to a dynamic approach. Cross sectional samplings raise questions as to the actual relevance of single snap shots of data at one point in time. Attitudinal studies are particularly problematic, because the wider contextual issues influencing responses are often ignored. In other words, the extent of positive or negative outcomes can simply be the results of a 'good day' or the effect of a 'bad day'(Moorman 1993).

A repeated measures approach can also be discounted. In terms of a career as a dynamic and evolving phenomenon it is inappropriate. Even with the availability of a sample career group embarking on their careers in a similar year, movement over time will differ. While some might experience accelerated careers, the pace of advancement of others may be relatively slower. Consequently, there appears little benefit in proceeding beyond the initial round of data collection in this approach, because it fails to take into account career movements in the intervening periods between samplings. In other words, a career can be represented as a discontinuous, rather than a continuous process. The review of research has also revealed a risk that the opportunity of follow up data collection can be eliminated by company take-over and/or changes in management policy as demonstrated in Bluedorn (Bluedorn (1982).

A longitudinal approach emerges as essential to reflect a career as a dynamic and unfolding process within the life course. However, this creates further practical considerations. The prospective longitudinal work of Smits (Smits, McLean & Tanner 1997) demonstrated the major problem when sampling extends over a number of years. Their study, even though limited to an eight year period,

experienced difficulty in maintaining contact and the involvement of many of the initial respondents. In turn, this limited the ability of these researchers to validly compare results from the subsequent samplings. The fact that many of the original respondents were lost over the course of the research also precluded being able to gauge to what extent graduates moved out of IS focussed careers. Given the chronic shortage of skilled IS personnel, this could have proved a highly informative aspect and positive outcome of this research. Obviously, over a more extended time frame (and bearing in mind that a career potentially spans a forty year period), the risk of losing original participants is even a greater.

For the purposes of the present research, access to student records spanning the twenty year history of the Department of Computer Science at the University of Tasmania provided an opportunity to adopt a longitudinal approach, but also determined that it needs to be based on retrospective data collection. While it is acknowledged that one of the major criticisms of this approach is the accuracy of human memory recall, from the literature there are recognised means of prompting the precision of recollection (Baker 1991); (Dex 1991) that can be factored in as a component of the research design.

### 3.6.4 Scope

A number of the outcomes from the review of career theory, broader career research and IS research have provided guidelines for this present research. In particular these are the:

- need to examine a career over the maximum period possible to reflect it as a process that occurs over a considerable proportion of the life course;
- desirability of a descriptive, quantitative research in career research;
- benefit of a CV approach as a prompt to human memory recall;
- need to apply a structured approach in the application of a CV as a form of career data collection;
- use of multiple forms of data collection;
- application of comparative analysis and the need to have some benchmark to substantiate the credibility of such an approach;
- identified gap in IS career research, given the chronic shortage of skilled IS personnel, in gauging the extent to which IS professionals either fail to enter, or else move out of the IS industry;
- positive worth of the application of analytic framework to guide data analysis;
- need to compare mobility patterns both within and outside the IS industry;
- perception of limited career path opportunities in the IS profession;
- established particular factors that are influential in determining positive experiences in the initial career appointment;
- substantiated the influence of initial career experiences and long term career decisions;
- determined the appropriateness of the development of purposefully developed questionnaire instruments.

This chapter has marked the culmination of the objective established at the beginning of Chapter Two. That is, it has applied a process of review of career theory, general

career research and, finally, IS career research to build a foundation to guide the present research. What this has served to determine is the scope and methodological approach that will be used to address the two research questions in meeting the stated objectives of this research.

To recap these are:

**Research Question 1: Career history**
*With a particular focus on career and work history mobility, what are the career experiences of graduates from the Department of Computer Science at the University of Tasmania who gained a bachelor degree based on a major in either computer science or information systems?*

As previously defined the interest in career represents a direct response to the chronic shortage of IS personnel by determining the extent of uptake of IS careers, either continuous or intermittent, among suitably qualified tertiary graduates. Work history implies duration within specific appointments, geographical location and change between employer organisations. To enrich the understanding of work history mobility it also examines the reasons that promoted career movement.

**Research Question 2: Initial post-graduation appointment**
*With reference to the initial post-graduation appointment and with a particular focus on original career choice, business sector and geographic location, how did graduates approach gaining and accepting the position and what is the extent of their mobility when engaged in this role?*

Within this research question original career choice aims to gauge the extent to which graduates initiated their careers in the IS industry. This aspect again relates to the chronic shortage of skilled personnel by providing feedback of uptake or movement out of IS careers. Work history mobility repeats the aspects defined in Research Question 1, these are, duration in specific appointments, geographical location and change between employer organisations. Research Question 2 also attempts to extend knowledge by gaining data of the approaches used to gain the initial career appointment and the criteria applied to decide acceptance.

With the contextual background determining the stance and scope of the research and the objectives established at the beginning of this thesis, Chapter Four moves to describe the methodology adopted in this study.

# CHAPTER FOUR: research methodology

## 4.1 Introduction

The aim of this chapter is to report and explain the research methodology used in working towards achieving the defined objectives of this research. In the introductory section of this thesis, the scope of the research was summarised as being based on three phases of data collection. In this chapter each phase will be considered in detail.

In outline, the structure of this chapter is based on the following sections:

- human ethics;
- research approaches;
- research design;
- Phase One - recruitment agency survey;
- Phase Two - newspaper IS recruitment survey;
- Phase Three - the graduate career survey;
- data analysis.

## 4.2 Human ethics

Prior to commencing this project it was necessary to obtain ethics approval. Research involving an investigation of human subjects at the University of Tasmania requires the approval of the University Ethics Committee (Human Experimentation). This body is accountable to the Academic Senate of the University and to the National Health and Medical Research Council (NHMRC).

As the present research fell within the definition of human experimentation, it was necessary to obtain ethical approval before any research could commence. When the project was approved, a requirement was the inclusion of an information cover sheet to accompany the survey. This contained a mandatory outline of the objectives of the survey and contact details in the case of problems arising as a consequence of the research. As human subjects were involved, evidence of acknowledgment of working within the Human Ethics Commitee guidelines are to be found at the beginning of the graduate career survey document (Appendix 5).

## 4.3 Research approaches

This research encompassed three independent phases involving different forms of data collection and sample populations. The specific methodology applied in each of these will be described and substantiated in this section. Neuman (Neuman 1991) defined the choice of research approach as based on four underlying reasons. These are why the research is to be conducted, how it will be used, the issue of time and the research technique applied. The three phases in this research are considered against these perspectives in Table 4.1. A brief explanation guiding the decision to adopt each follows.

**Table 4.1: The three research phases based on Neuman**
(Neuman 1991)

| | | Phase 1 | Phase 2 | Phase 3 |
|---|---|---|---|---|
| | | HR agencies | IS recruitment | Graduate survey |
| **1. Reason** | exploratory | ■ | ■ | |
| | descriptive | | | ■ |
| | explanatory | | | |
| **2. Use** | basic | | ■ | ■ |
| | applied | ■ | | |
| **3. Time** | | | | |
| cross sectional | | ■ | | |
| longitudinal | | | ■ | ■ |
| case study | | | | |
| **4. Technique** | | | | |
| quantitative | experimental | | | |
| | survey -questionnaire | ■ | | ■ |
| | content analysis | | ■ | |
| | existing statistics | | | |
| qualitative | field research | | | |
| | historical-comparative | | | |

Before substantiating the chosen approaches in each of these phases, it is necessary to recap that this research was founded on the assumption that while many graduates will have taken up IS careers, others will have pursued alternative careers. So while the orientation was toward IS careers, interest also lay in identifying the areas where those apparently lost to the IS industry have established their careers.

The first two phases of this research were specifically undertaken in support of the primary focus of this research. Within each of these, the purpose was to locate the research in a perspective of time and the labour market for IS personnel in Australia. In turn this information contributed to a further objective of this research which was to gain a practical insight into the career dynamics of the graduates targetted in the graduate career survey.

### 4.3.1 Phase One - a survey of human resource agencies

Phase One in this research was based on a cross sectional sampling using a questionnaire survey administered to human resource agencies across Australia.

#### *4.3.1.1 Reason*

The aim was to gain a profile of the recruitment of IS professionals in this country in the 1990s and also established a 'feel' for the research area. This familiarisation was necessary in view of the paucity of available published literature focussing on the topic. As such this stage in the research was regarded as exploratory (Neuman 1991); (Baker 1991).

Following Neuman the objectives of this form of approach was to:

- 'become familiar with the basic facts, people and concerns involved;
- develop a well-grounded mental picture of what is occurring;
- generate new ideas and develop tentative theories and conjectures;
- determine the feasibility of doing additional research;
- formulate questions and refine issues for more systematic inquiry;
- develop techniques and a sense of direction for future research ' (Neuman 1991:29).

Baker (Baker 1991) proposed exploratory research as appropriate when it is required to identify alternative courses of action. This supports the stated objective of this phase in the research.

#### *4.3.1.2 Use*

In the sense that the designated application of the human resource agency survey was that of a foundation pilot, this phase is defined as applied research. That is, there was no intention to independently use any results from this survey for scholarly publication. The outcome of the human resource agency survey was projected to support the subsequent phases in the research. According to Neuman this is one of the main determinants to differentiate between basic and applied research (Neuman 1991). In particular aspects from this phase were projected to be incorporated into the design of the Phase Two, the newspaper survey so that in turn both these phases would contribute to the construction of Phase Three, the graduate career survey.

#### *4.3.1.3 Time*

In keeping with the aim of Phase One, this survey involved a single, cross sectional approach to obtain a snapshot of IS employment in the 1990s. While proponents of longitudinal research (Davies & Dale 1994) generally argue against this method, it was considered appropriate in this current context where the requirement was to gain a brief illumination (Baker 1991).

#### *4.3.1.4 Technique*

Within this stage, data collection was based on a quantitative questionnaire survey. The major advantage of this approach was that it was possible for a single researcher to target a widely distributed geographical sample and at relatively low cost. The greatest disadvantage was the high risk of a low response rate, in which case the validity of any reported findings are open to question. However, given the stated objective and application of this survey should this happen then the effect would not be too crucial.

### 4.3.2 Phase Two - IS newspaper recruitment survey

#### *4.3.2.1 Reason*

The aim of this phase in this research was two-fold. Firstly, to obtain a background of the IS labour market reflecting the twenty year period when degrees with computer science, and much more recently, information systems majors, have been available at the Hobart campus of the University of Tasmania. Secondly, to gain an

insight into the labour market at the different times when graduates, as defined in this research, were embarking on their careers.

The defined scope of the IS newspaper survey was purposefully broad to gather data beyond that specifically targetted to support the graduate career survey. For the small amount of extra effort required this was seen as optimising the return as a consequence of the data collection process. As such the IS newspaper employment survey has been defined as semi exploratory. That is, while a portion of the results have been applied in support of the next, and major graduate career survey, remaining areas of the results provided for wider independent research. So, Phase Two was also defined as descriptive. In this regard to date two papers related to IS careers have been published (Young 1996); (Young & Keen 1997).

#### *4.3.2.2 Use*

Based on the multiple reasons underlying the application of Phase Two stated above, this stage in the research was defined as both basic and applied research.

#### *4.3.2.3 Time*

Phase two was based on a longitudinal survey involving periodic samplings covering a twenty year period from 1975 to 1995. This time frame coincided with the existence of the Department of Computer Science at the University of Tasmania from its establishment in 1975. Within Phase Two the data were gathered using five cross sectional samplings undertaken at five year intervals during this period. The application of this approach fulfilled the requirement of gaining an insight into changes in the Australian labour market covering the established period of the research.

#### *4.3.2.4 Technique*

In this stage of the research a quantitative technique was also applied, but this time it involved a content analysis of newspaper IS recruitment advertisements representative of the Australian IS labour market. As a source of data this form of sampling has the advantage that it provided factual and historical information which was freely accessible.

While this form of data collection does not incur the expenses (postage, telephone, travel etc.), depending upon the scope of the analysis, in terms of human labour the cost can be high. Here there was a trade off between the use of multiple coders involving payment, training and the establishment of intercoder reliability, or the involvement of a single coder. In the former the problem of habituation then arises. That is, when only one coder was involved, over time they could become increasingly sensitised to specific data to the exclusion of other, and also relevant, data (Wall 1997).

### 4.3.3 Phase Three - graduate career survey

#### *4.3.3.1 Reason*

Stage Three was the final and major stage of this research. Based on a survey of graduates, as defined within the context of this research, this represented the primary source of data to address the research questions posed in this thesis. Here the

approach was defined as descriptive following its close alignment with the criteria of descriptive research to:

- 'provide an accurate profile of a group;
- describe a process, mechanism, or relationship;
- give a verbal or numerical picture (e.g., percentages);
- find information to stimulate new explanations;
- present basic background information or a context;
- create a set of categories or classify types;
- clarify a sequence, set of stages or steps;
- document information that contradicts prior beliefs about a subject' (Neuman 1991:20).

#### *4.3.3.2 Use*

The proposed application of the graduate career survey determined stage three to be basic research. That is, it met the criteria of advancing 'fundamental knowledge about the social world' (Neuman 1991:20).

#### *4.3.3.3 Time*

The graduate career questionnaire was based on a retrospective, longitudinal approach to gather the work histories of graduates, including a detailed focus on their initial post-graduation employment experiences. It involved a twenty year period to coincide with the complete history of the Department of Computer Science beginning with the original graduates up to, and including, those graduating in 1995.

When work histories are involved, the literature supports the retrospective collection of continuous data (Davies & Dale 1994); (Sonnenfeld & Kotter 1982). In particular, a longitudinal approach is appropriate to capture the dynamics necessary to identify the patterns of movement that form the focus of this research.

While it is acknowledged that retrospective data collection is at risk of the quality of human recall, as the accuracy of data obtained hinges on the ability of human memory, this has been taken into consideration within in the design of this research. According to the laws of memory (Baker 1991), the inclusion of a major event (in this case the initial post-graduation appointment) acted as a stimulus to aid recall. That is, while trivial events would be quickly forgotten, milestones in a life history persist in memory (Baker 1991); (Dex 1991); (Neuman 1991). To this end, in research involving a recall approach this should form an essential feature of the research design (Baker 1991). The structure or the order of questions was a further important feature to assist recall (Dex 1991). Both these aids have been incorporated in the design of the graduate career survey and will be explained when Phase Three is elaborated in more detail later in this chapter.

At a practical level for research focussing on career histories, the time constraints of a doctoral candidature simply do not support the application of a prospective, longitudinal repeated-measure data collection. That is, an approach based on tracking a sample population and gathering data at predetermined subsequent periods. In terms of both financial and human cost, the administration of a single survey is far lower. Also because of the one-hit data collection the retrospective approach is not

susceptible to one of the major limitations of longitudinal repeated measure research. That is, the risk that over the time of the study, a large number of the initial sample population may be lost as demonstrated in the longitudinal work. In particular the work of Wagner and Benham (Wagner & Benham 1993) and Smits, McLean and Tanner (Smits, McLean & Tanner 1997). Both these studies extended over an eight year period and during that time the number of continuing respondents halved.

The major perceived benefit from this approach was that it was an opportunity to trace career experiences extending up to 20 years in duration. In terms of career theory, more specifically, the developmental models (Super 1984), this length of involvement represents a considerable proportion of a working career. That is, the work histories of the earliest graduates, in particular, would be reflective of careers that had moved beyond an exploratory stage, and represented a considerable proportion of the establishment stage which is said to extend to about forty five years of age.

#### *4.3.3.4 Technique*

The graduate career survey was based on the administration of a questionnaire survey. This study represented a new perspective of career investigation, so the design and development of an original and application-specific questionnaire was expected to be a significant contribution of this research. One of the primary objectives was to produce an instrument founded on theory. Due to the potential diversity of graduate careers, another foremost consideration was to achieve a balance between developing an instrument capable of capturing details of IS and non-IS careers and, also obtaining the desired level of detail from an IS perspective.

This necessitated looking at the wider research field and eventually guidance was drawn from an interdisciplinary perspective (Dex 1991); (Davies & Dale 1994). From this, in particular, the emergence of the CV as an important source of data in work history research was recommended leading to its application as the structure for Part 1 of the graduate career survey. With reference to Myers (Myers 1991), the earlier work of Slater (1979) had identified problems associated with the use of CVs and so provided valuable information preclude a recurrence in this present study.

In summary, this portion of the chapter has established the fundamental considerations in the design of the methodologies used in this research. These were based on a framework drawn from Neuman (Neuman 1991).

## 4.4 Research design

The research is graphically summarised in Figure 4.1 and shows the investigation spanned a four year period. During this time frame, each phase built on the previous one and was executed in the sequence shown.

To provide a sample population, a parallel process involved the establishment of the graduate database. It was an on-going activity scheduled to ensure this was developed to provide the most up-to-date graduate contact information for the administration of the graduate career survey. Timing was considered essential to maximise the opportunity to gather work history data by achieving the best possible contact rate for the distribution of the graduate career survey.

Figure 4.1 also shows that the first two stages of data collection focussed exclusively on IS careers, while the third involved graduate careers regardless of career focus. This fulfilled the orientation towards IS careers by initially building a background in relation to employment in the industry, which in the final phase broadens to gain a holistic insight into the careers of these graduates.

In both Phase Two and Phase Three, pilot surveys were conducted prior to the main data collection. A minor activity in Phase Three also, was the construction of a descriptive pamphlet produced to accompany the graduate career survey. For reasons outlined later in this chapter, this was perceived as potentially conducive to enlisting support for the project.

More detailed explanations of each area of activity included in the research design follow next in this chapter.

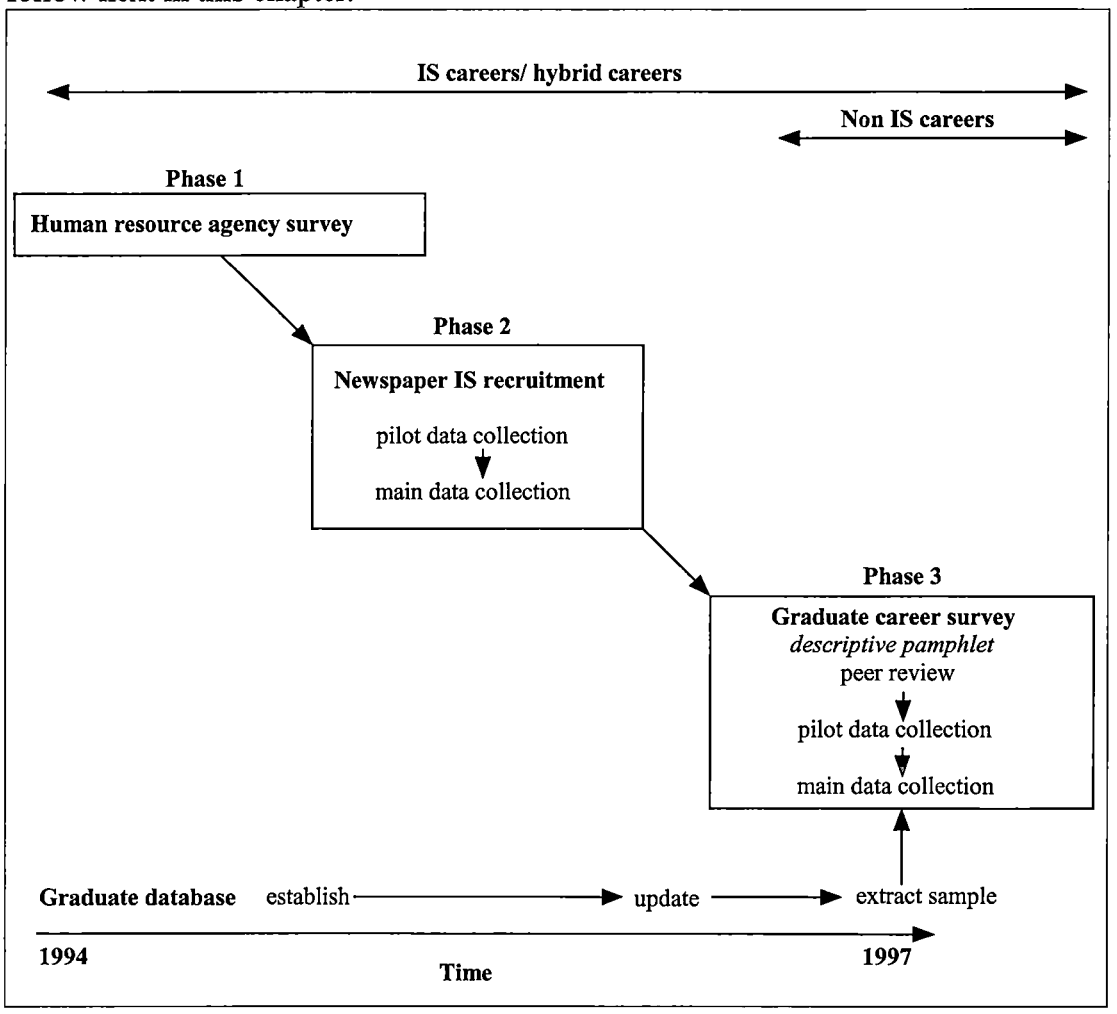


**Figure 4.1: Research design summary**

## 4.5 Phase One - human resource agency survey

Earlier in this chapter the aim, scope and methodology for each of the three phases involved in this research were established. In the section that follows each of the working application of the methodologies within each stage will be elaborated in greater detail.

### 4.5.1 Aim

To recap, Phase One was conducted in support of the primary focus of this research on IS careers. This initial phase of data collection was based on a survey targeting human resource agencies. Due to the lack of any comprehensive literature in the area of IS careers, Phase One was necessary to gain an introduction to the area of IS employment. It was undertaken with the objective of investigating this area as a potential source of data and, at the same time, to gauge the then current (1995), employment situation for IS personnel across Australia.

As already established, Phase One was based on an exploratory, cross sectional approach. For the purposes of the research reported in this thesis, the outcome from this survey was used as a basis for the two subsequent surveys. In the first instance, it was proposed to use the results to the benefit of the construction of the newspaper IS employment survey. The findings from both preliminary surveys were also then to be incorporated as a basis for the design of the graduate career survey.

### 4.5.2 Scope

The target sample included 86 Australian recruitment agencies selected from the, then current, 1995 Yellow Pages display section of the Telstra telephone directories held in the University Library. This resulted in a sample population of 71 human resource agencies located in capital city areas and 15 in smaller population centres. The only state not represented in the sample was Tasmania, as initial phone contacts with agencies using this medium of advertising claimed no involvement in the employment market for IS professionals. Even though this simply could have been a response to discourage involvement, it established that even if the survey was distributed to this group, it was highly unlikely any would participate.

### 4.5.3 Method

#### *4.5.3.1 Survey instrument*

A position vacancy form was developed with reference to IS employment (Appendix 1). The front of this sheet was set out to allow for the collection of data with reference to nine aspects of computer science / information technology positions registered with an organisation. Along with an opportunity for respondents to note comments, these were:

- organisation type (private, public, government);
- industry category (from a provided list based on ACS classifications);
- organisation size(<50, 51-200, >200, don't know);
- position title (from a provided list based on ACS classifications);
- position description (description of required duties);
- status of position (contract, temporary, permanent);
- essential qualifications (open response question);
- preferred qualifications(open response question);
- position incentives (open response question).

To guide responses in questions 2 and 4 (industry category and position title) the over side of the position vacancy sheet provided lists based on categories defined by the Australian Computer Society (Appendix 1). Australian Bureau Statistics job

codes were not used because these were found to be not only limited, but obviously so out of date as to not being representative of the IS labour force.

#### *4.5.3.2 Administration of the questionnaire*

Recipients in the major population centres were forwarded ten position vacancy sheets, while the small organisations received five. Depending on this, they were asked to complete one form for the next ten or five vacancies (as appropriate) registered for IS professionals with their agency. The adoption of this approach was seen as more conducive to promote participation than setting data collection on a predetermined time frame. This could have created a perception that it would provide a measure of business throughput, which, obviously, most agencies would prefer to remain confidential from public disclosure.

Along with a stamped, self addressed envelope, the questionnaires were mailed to the targetted agencies in January 1995. As an added incentive to complete the survey, the documentation also included an offer of a report to be produced at the end of the project.

A reminder letter was sent to 65 agencies in March 1995 from which no further responses were forthcoming. The details of those who completed returns and indicated their interest in receiving the report have been noted and will be honoured. In keeping with the prestated exploratory nature of this initial phase of data collection it is appropriate to report the results in this chapter.

#### *4.5.3.3 Response rate*

The overall response rate was 8% which was well below the level generally regarded as acceptable in the IS research literature. In Australia, this has been typically reported as between 17 to 25% (Klobas & McGill 1992), (Watson 1989). Although lower response levels have been reported in the IS literature, the targetted sample has been much larger. For example a 9.2% response rate in a study involving over 1000 IS personnel (Dengate, Couger & Weber 1990).

From the original 86 surveys distributed,15 were returned as either address unknown and one attached letter advising that they did not represent this sector of the employment market. Six useable responses were also received.

Of the six agencies who did participate, two responses were received from Queensland, two from Victoria, one from Western Australia and one from South Australia. Only four of the agencies receiving the larger bundle of survey forms responded. Of these one returned only four position vacancy forms explaining that they handled relatively few vacancies in this area and that it would take nearly twelve months to accumulate the requested number of completions. In addition, a single completed position vacancy form was received from one of the small organisations.

Despite the low response rate the human resource agency survey did fulfil its primary objective. Even though the data was of limited quantity, it was still sufficient to prove a useful form of feedback in relation to the structure of questions and the parameters for consideration when setting up the next survey. As such it still fulfilled

the role of an effective pilot for the two subsequent phases of data collection in this research.

### 4.5.4 Application of results from human resource agency survey

The data obtained from this survey are summarised in Appendix 2. As the predetermined purpose of conducting this survey was to incorporate the outcome into the two subsequent surveys projected within this research, the application of these results are included in this chapter. It is now proposed to comment briefly on the outcomes and revisions effected in the two subsequent surveys as a result of the agency survey.

*1. Organisation type*

In hindsight the precoded response categories provided in this question were revealed as susceptible to ambiguous interpretation. In the later graduate survey the choice was changed to three categories: public, government business enterprise and private organisations.

*2. Organisation category*

It appeared evident that some respondents had difficulty using the provided ACS categories to classify industry focus. To eliminate this problem, and also to gain the widest possible representation in the graduate career survey, in this instrument an open format question was used.

*3. Organisation size*

Most respondents in this survey selected the mid range (51-200 employees). While the ABS defines small, medium and large business as having less than 20 employees, 20-199 employees and 200 or more employees consecutively, given the relatively small number of Tasmanians, some adjustment to these size classifications was indicated. In June 1998, the Australian Bureau of Statistics reported the total Australian population to be 18.7 million people of which only 472,000 (approximately 2.5%) were resident in Tasmania. Reflecting this the gross state product of under $10 billion represents only 2.1% of the Australian total (Industry Audits, 1999). Consequently, new business size categories were adopted in the construction of the graduate career survey. More realistically these were adjusted to describe operations based on less than 21 employees, 21-100 employees or 101 plus employees. This decision was reinforced during the pre pilot peer review of that survey by an eminent economist and professor at the University of Tasmania.

*4. Position title*

One of the most positive results from the human resource agency survey was that in the returns approximately 25% of responses showed titles not contained in the ACS definitions. In light of this, and in consideration of the IS literature, in future surveys this question was approached from an open perspective. Through this, the dynamic nature of IS careers can be acknowledged and representative positional titles obtained.

*5. Position description*

This question was included in this survey project as having further application in the newspaper survey. The keywords obtained from the description of the duties

contributed to the construction of the precoded categories used for this field during the IS newspaper recruitment survey.

*6. Status of position*
The results of this question in the survey showed that IS appointments offered through these employment agencies were almost equally divided between contract or permanent positions. This outcome was noted for further consideration during the pilot study within the IS newspaper recruitment survey.

*7 and 8. Essential and desirable qualifications*
In the human resource agency survey both these questions produced overlapping data. For this reason in the two further surveys, qualifications meaning degree and/or diploma were treated individually with each approached as either essential or preferable.

The collection of data with respect to skills, knowledge and experience was never a consideration for the graduate career survey. Obviously in the retrospective approach used in that survey the inclusion of non significant unmemorable facts would be inappropriate (Baker 1991). However as a consequence of the results from the human resource survey, the design of this aspect of the newspaper recruitment survey adopted a stratified approach. In effect this means that if knowledge or skills were stated requirements, then this was followed through in the data collection to the lowest level of detail which could involve specific areas or the preferred length of experience.

*9. Position incentives*
The comments from this section of the data are the same as for Question 5. That is, key words were extracted to establish precoded categories within the newspaper employment survey. Those initially included were subjected to the pilot survey and refined during the main IS newspaper recruitment survey.

In conclusion, while not reaching anywhere near the potential data it could have provided, the survey of human resource consultants did contribute significantly to knowledge and understanding of IS employment in Australia. Even though the amount of information gained was very limited, it did partially meet one of the original objectives to provide some 'feel' for IS recruitment issues. The data obtained did, however, provide some useful feedback and guidance subsequently applied to advantage during the construction of the newspaper and graduate surveys. In hindsight the imposition of additional work in sometimes small and busy agencies operating on minimal staff levels was most probably the greatest disincentive to participation.

## 4.6 Phase Two - Newspaper IS employment survey

### 4.6.1 Aim

Phase Two in this research was the next stage in an on-going strategy to support the major focus of this study in IS careers. As established earlier, there were dual objectives behind conducting this survey. These were to:

- gain an overview of employment in the IS industry spanning the twenty year time frame involved in this research;
- obtain a background of IS labour market conditions at the different times when graduates were embarking on their careers.

The methodology applied in Phase Two has been defined as based on the proposed multiple application of the results from this survey. That is, it was both exploratory and descriptive. For while the primary objective was to support a contextual background for the graduate career survey, at the same time the results were also seen as the potential source of data for independent research activities.

### 4.6.2 Scope

This aspect of data collection was based on a longitudinal, periodic content analysis of IS employment newspaper advertisements. While this sampling of newspaper advertisements was also regarded as a minor survey, it was more comprehensive than the preceding human resource agency survey. The major benefit of this sampling was that it was based on a readily available source of factual data. In the absence of access to human resource records of a similar magnitude and encompassing the twenty year time frame, it was considered the only option for obtaining associated, parallel data reflecting the sampling period of the graduate career survey.

The scope of this survey was defined according to three perspectives. These were:

- targetted newspapers;
- time - both longitudinal and periodic;
- types of advertisement to be sampled.

#### *4.6.2.1 Newspapers*

The first area of scope was the definition of newspapers to be targetted for data collection. The *The Australian*, *The Age* and *The Mercury* were chosen to represent the labour market for IS personnel nationally, in a large Australian capital city (Melbourne with a population of 3,371,300*) and locally, within the city of origin where the graduates obtained their degrees (Hobart 195,000*). The underlying strategy supporting this choice was to gain information relating to employment in the IS industry from an Australia wide viewpoint and, at the same time, to locate Tasmania in the national labour market for this sector of the labour force. Given the often limited home state employment market for Tasmanian graduates, and also the acknowledged high mobility of IS professionals in general (Bartol & Martin 1983), this last aspect was a significant consideration in the context of this research project. (* 1998 population projections from the Australian Bureau of Statistics)

#### *4.6.2.2 Time*

The second area of scope involved the definition of two sampling parameters. Firstly, the time frame of the proposed was established. Secondly, when the periodic samplings should occur within this time frame were determined. The first established a twenty year time frame. This survey was based on a longitudinal, periodic sampling covering the period from 1975 to 1995. The earliest was chosen because it coincided with the year when the Department of Computer Science was established. Consequently, it provided a foundation description of employment at a time when the initial intake of graduates were commencing their degree courses. The next time

frame, 1980, not only marked the earliest graduations but also approximates an earlier stage in the establishment of the computer industry in Australia. The last sample period, 1995, as well also linked with the recruitment agency survey and so provided a further insight into recent IS labour market information.

The second area of time established in the IS recruitment survey, related to the setting of the periodic samplings to be included in the survey. This was established to target one day each month, at five year intervals and included the years 1975, 1980, 1985, 1990 and 1995. The four most recent of these were selected to tie in with the graduation cohorts proposed for the graduate career survey. These were considered necessary to address the differing lengths of careers that would be involved and also it would provide the basis for comparisons over time in the twenty year sample period. Targetting these five yearly periods, *The Australian* was sampled on a Tuesday, when a special supplement dedicated to computers and computing and IS recruitment was published. The third Tuesday in each month was sampled. In the case of both *The Age* and *The Mercury,* the third Saturday was targetted because it was the main day for recruitment advertising in these publications.

#### *4.6.2.3 Advertisements*

The third area where parameters for the scope of the IS newspaper employment survey were defined was in relation to the actual advertisements sampled. Contract, classified employment, sales and sales support positions were excluded. While the above average participation of IS personnel in contract employment would guarantee a large number of samples, the actual content of such advertisements was found to be frequently obscure or extremely brief. So for an almost overwhelming effort, the return for the purposes of this research was seen as being of little value in providing meaningful information. For a similar reason classified advertisements were also ignored. In addition, sales and sales support positions were accepted as more frequently targeting applications from people with selling ability and often not necessarily tertiary qualified applicants.

The IS position advertisements sampled therefore were limited to display advertisements inserted directly by organisations or by recruitment agencies. With larger display advertisements, when three or more positions were involved, it was found that the amount of detail describing the position was reduced, so for this reason, only those containing two or less positions were sampled.

### 4.6.3 Method

#### *4.6.3.1 Pilot newspaper advertisement survey*

A pilot survey preceded the main newspaper sampling which allowed the process of sampling to be streamlined in allowing for more pertinent information to be obtained in the most efficient manner. The initial draft survey was constructed applying feedback obtained from the results of the earlier human resource agency survey. In particular, this served to establish the benefits of effort and efficiency to be gained through using predetermined categories based on frequently recurring key words and binary coding. In addition each contained an 'other' classification to allow the data to be expanded to accommodate emerging areas.

Data collection involved the hand transcription by the researcher of key words from 100 recruitment advertisements appearing in *The Age* newspaper taken from Saturday editions published in 1996. During the course of this process some fields were added, while others were deleted. For example, details of the recruiting organisation's size and type, while originally targetted, proved to be frequently unidentifiable or ambiguous. As satisfactory levels of information could not be obtained, for these details, the collection of this data was discontinued.

#### *4.6.3.2 Survey instrument*

The actual content sampled, and the categories included, were developed as a consequence of the pilot survey. The developed data collection sheet is to be found as Appendix 3). In addition to the demographic details (a unique identifier number, newspaper source and date according to month and year) the following categories were sampled:

- position description;
- qualification requirements;
- position incentives;
- organisation;
- industry skills & experience;
- personal attributes.

Apart from the first of these the remainder were precoded each containing an 'other key word' sub category to allow the identification of emerging topical areas. For each of the precoded categories a classification scheme was developed for application during the data collection process (see Appendix 4).

It is acknowledged that these classifications are not confined to the data required for the research reported in this thesis. For reasons explained earlier, the small amount of extra time required to collect a more complete representation of the IS labour market was considered worthwhile. In the first instance this relates to economies of scale and the opportunity for independent research publication. Some of this 'additional' information has already been used to benefit. As reported earlier when the research methodology was established for this survey, to date, portions of this data set have been used in two research papers focusing on aspects of recruitment for IS personnel. The purposefully broad scope could also potentially discover an aspect of emerging importance which could have been subsequently incorporated and addressed in the graduate career survey.

#### *4.6.3.3 Main newspaper advertisement survey*

The main sampling in this survey applied the criteria established in the pilot study, with all data collection was undertaken by the researcher. It involved a content analysis read from microfilm and hand transcribed to a data collection sheet specifically developed for the purpose. Training in the process had been gained during the pilot, so any effect of training in the main data collection was minimised. The sampling was undertaken by one person to ensure consistency in classifications and interpretation of the contents of the advertisements.

Coding of each newspaper was undertaken in an order beginning at the mid point of the sampling range (1985) and moving back to 1975. Employment advertisements

meeting the stated criteria during 1990 and 1995 were then sampled. This approach was applied to minimise any effect of sensitisation which can occur during this form of repetitious sampling. That is, as familiarity with the process increases, the focus can become limited to specific aspects of the data (Wall 1997). When this happens the accuracy of the data is at risk of bias introduced due to selectivity of the coder.

The demographic results from this survey will be included where appropriate in the three results chapters to follow in this thesis. It is, however, considered appropriate to point out the extent of the data gained as a result of conducting the newspaper content analysis. Overall, based on the defined scope of the IS recruitment survey, data were collected representing 2891 cases, of which 1131 were for nationally advertised positions, 691 appeared in *The Age* and a total of 69 vacancies were offered locally through *The Mercury*. This is noted at this point in the thesis to demonstrate the depth of understanding gained in relation to IS career issues. At the same time it is offered as evidence of the quality of the background contributing to the design of the graduate survey.

## 4.7 Phase Three - the graduate career survey

### 4.7.1 Aim

The graduate career survey marked the culmination of this research. As such, the stated aim of Phase Three was to address the research questions posed in this thesis:

**Question 1: Career history**
*With a particular focus on career and work history mobility, what are the career experiences of graduates from the Department of Computer Science at the University of Tasmania who gained a bachelor degree based on a major in either computer science or information systems?*

**Question 2: Initial post-graduation appointment**
*With reference to the initial post-graduation appointment and with a particular focus on original career choice, business sector and geographic location, how did graduates approach gaining and accepting the position and what is the extent of their mobility when engaged in this role?*

These questions were purposefully structured to meet the two underlying objectives of this research. The first was to obtain a holistic insight into the careers of these graduates by not focussing solely on IS careers and also examining the alternative careers some graduates have pursued. The second was to address these questions in a form that would be accessible to a wide audience of readers.

### 4.7.2 Scope

The graduate career survey was based on a longitudinal recall questionnaire. It was constructed as a two part instrument and administered to graduates gaining a bachelor degree with a third year major in either computer science or information systems from the Department of Computer Science at the University of Tasmania. This included graduates representative of the complete history of the Department since its establishment in 1975 which implies that some of the work histories collected would cover almost twenty years in the labour force.

In keeping with the research questions and the two aspects of a career under scrutiny in this research, the graduate career survey is based on a two part instrument. Part 1 was aimed at capturing the dynamics of the employment experiences of graduates while Part 2 was dedicated to issues in relation to the initial post-graduation appointment.

### 4.7.3 Survey design

As stated during the outline of the methodology applied in this stage, the development of the graduate career survey was a significant undertaking within this research. The construction of an application specific instrument followed a precedent established in the comprehensive career research of Arnold and MacKenzie Davey (Arnold & MacKenzie Davey 1992). To capture the dynamics involved in a career this research came from a social mobility (Rosenbaum 1979a) perspective. Social mobility has been defined as a collective term in sociology which can include 'geographical movement, occupational changes, changes between institutions or firms and changes of status within institutions (Rosenbaum 1979a)'. Further this can be either be between generations (ie comparing the careers of parents and their children) or career mobility within a single career.

The major reason for the construction of an application specific instrument was the originality of this study in its approach to IS career research. More substantive IS career research has been largely been based in psychology (McLean, Tanner & Smits 1994) or had foundations in work design (Couger & Zawacki 1980). While longitudinal studies have been reported, these have not involved retrospective data collection. Consequently, the application, let alone the adaptation, of a survey drawn from the available IS career literature was never a viable option.

The graduate career survey document comprised a total of seven pages (Appendix 5).

The first page introduced the objectives and scope of the research followed by a description of what participation involved. To encourage participation, in particular, this emphasised the simplicity and brevity of the survey. The second section of the cover page included the mandatory human ethics information, including an assurance of confidentiality and contact details in the case of concern or complaint by recipients.

The over side of the initial page was purposefully left blank, apart from a statement welcoming comments in this space. This was considered an essential component because it allowed participants to contribute their ideas and opinions. More importantly, this approach was viewed as conducive to participation through creating a feeling of having some stake in the project.

The next two pages make up Part 1 of the graduate career survey. The first of these provided instructions and also a working example of how to complete this section in the survey. The second presented the analogy of a CV constructed to gather data purposefully limited to the required career history details. The structured approach addressed the major problem experienced by Slater (Slater 1979) when a request for respondents to supply an up-to-date CV resulted in a wide diversity of information. An overview of the contents involved is shown in Table 4.2. These two pages were

single sided to allow participants to readily move and make reference between the instructions and the section requiring completion.

The remaining four pages of the graduate career survey focussed on Part 2, which was dedicated to initial post-graduation experiences. In Chapter Two evidence of the essential nature of this period in a career and its potential to influence future career decisions has been established. As such, in the context of this research, this was considered an essential component to gain a holistic overview of the careers of potential IS professionals

This section contains eleven questions and followed a more conventional questionnaire format. A brief description of the objective for each question and, where appropriate, support for its inclusion follows shortly. At this stage, where the structure of the questionnaire is being considered, it suffices to say that the Part 2 included a mix of structured and sometimes semi structured questions.

#### *4.7.3.1 Part 1- structure*

When attempting to locate a suitable instrument for replication in this survey, reference was made to research focussing on life and work history. From this, the emerging importance of the curriculum vitae as a source of data in work history studies was noted (Dex 1991). Since in effect the first question in this research was applying such an approach, it made sense to construct this section of the survey based on the analogy of a CV. This is considered one of the strengths in the design of the graduate survey because this format not only offered practical administrative benefits, it also addressed one of the major problems associated with data retrospectively collected from human subjects. That is, the inaccuracy associated with human memory recall (Sonnenfeld & Kotter 1982).

The adoption of the CV format was seen as offering three major advantages. These were:

- conducive to participation - simple and so only required minimal time to complete;
- graduates would be familiar with a CV and so virtually no new learning was involved;
- many recipients would have access to a reasonably current CV, so participation would only involve the transcription of the required contents.

The last advantage, also provided a number of benefits in the design of the graduate career survey. These are not necessarily mutually inclusive and relate to:

- accuracy;
- aid to memory recall;
- ease of coding.

Based on the assumption that most graduates would maintain a relatively up to date CV, the chance of error would be low. Two other features of the CV offset the problem of the correctness of memory recall. The first has been referred to as the laws of memory, meaning that a major event can act as a stimulus to aid

reconstruction (Baker 1991). As such this has been recognised as an essential component when human recall is involved (Baker 1991). In this research the inclusion of the initial post-graduation position fulfilled this role. The second was that structure and order are important guides (Dex 1991) which was achieved through the chronological order of the CV.

From a practical perspective the analogy of a CV provided a work history viewed in a single page snapshot. This enabled the straightforward handling and coding of data. This approach also eliminated the problems encountered by Slater (Slater 1979) where simply requesting copies of existing CVs produced an overwhelming collection of diverse data.

Table 4.2 shows an abbreviated outline of the structure and the variables contained within this section of the survey. The actual survey sheet provided sufficient space to record up to fourteen positions and carried an instruction to continue in the same format on a plain sheet should a greater number be involved. It also contained prompts for the precoded variable responses. It is important to note that in the instructions respondents were asked to complete this section of the survey commencing with their first full time position following graduation and ending with their current appointment. This is an important requirement as it complied with the perceived benefits in memory reconstruction by maximising the stimulus of a significant event followed by an ordered recall. A more detailed explanation of each field in this section of the survey follows while as already stated, the instrument in its entirely can be found as Appendix 5.

**Table 4.2: IS recruitment data collection sheet**

*A summary of your working career (beginning with your first position and ending with your most recent position)*

| 1. Status | 2. Industry | 3. Position | 4. Computing professional | 5.Employment duration | 6. Organisation | 7. Location of job | 8 Why change job? |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

### *4.7.3.2 Part 1 - content*

The primary objective of the graduate career survey was to address the two questions posed in this thesis. To achieve this aim Part 1 focussed on capturing the career dynamics of respondents. Three of the 8 variables in this section relate directly to the three aspects under scrutiny in this question. These are career, organisational mobility and geographic mobility.

The remaining five are seen as being supportive or explanatory or both of these. For example, computing professional and position title allowed a follow through of career paths where the data indicated an IS or a hybrid career stream. Similarly, the reason for job change (variable 8) made it possible to distinguish between internal and external career movements. Duration provided an indication of the rate of mobility within the graduate career histories. Industry, while not directly projected for application in this research, provided the basis for future work. Status considered the type of appointment within this graduate sample and the perception of characteristically high contract employment involvement of IS personnel.

Before substantiating the inclusion of these eight variables in Part 1 of the survey, it is also necessary to consider three purposeful omissions: career success, remuneration and name of employer organisation. In addition, while demographic information appears to be a major omission, it was unnecessary in the graduate career survey. The graduate database, which was specifically established for the purposes of this research, provided an accurate source of background information about these graduates. In particular, this provided demographic details such as date of birth, gender, degree, undergraduate curriculum and year of graduation. Consequently, this allowed the graduate career survey to be concise and also appear less intrusive to participants.

#### *4.7.3.3 Part 1 - Exclusions*

Within this section of the graduate career survey, there are three purposeful omissions. The rationale for all these, is that each has the potential to diminish the participation rate in the survey. These were:

- career success;
- remuneration;
- identity of employer organisations.

*Career success*

This omission was founded on the premise that when posed with this question respondents could gain an impression that a major objective of this research was to report of the career successes (or otherwise) of graduates. This could have created a situation where recipients felt confronted with peer comparison, and those who considered their career as moderately successful, or worse might have been less inclined to participate. Many could have also felt uncomfortable to admit failure and so provided erroneous information. A second valid reason for not pursuing this information was the problem of how to measure career success. In the absence of well founded measures then responses must be, at the best, subjective. When faced with peer comparison, the risk of gaining inaccurate data would potentially be high, raising doubts of the quality of any results generated in the research. Finally, because the targetted sample have entered the labour force at different times over a twenty year period, the question arises; at what stage in a career should the success or otherwise of a career be measured?

*Remuneration*

Two reasons support the exclusion of salary in the graduate career survey. Firstly, because of the time span involved, due to the change in salary rates, such data would be irrelevant. For example, during the extremes of the time frame involved there would probably be a $20,000 p.a difference between entry level salaries. The second aspect was that of accuracy. Here a number of issues arise. One relates to the ability of graduates to accurately recall such information which potentially could have extended back 20 years. The other issue of accuracy is also linked to the second reason why remuneration was not included as a variable. The competitiveness of human nature means that graduates could have been tempted to supply inflated amounts as an indication of a successful career. This leads to the second reason why salary details were not requested in the career survey. It was based on the premise that because this could be a sensitive issue for some recipients and, in a worst case scenario, a requirement for such data would have discouraged participation.

*Name of employer organisations*

The third reason purposeful omission in the design of the graduate career survey was requesting details of the name of employer organisations. It is proposed that this not only reinforced anonymity, but it also allowed respondents to freely express the positive and negative experiences related to their initial post-graduation appointment.

#### *4.7.3.4 Part 1 - Inclusions*

With reference to Table 4.3 each of the eight variables forming this portion of the graduate career histories are now described in more detail. Where appropriate these will be introduced with a reproduction of the response options offered to respondents. The reasons for their inclusion will be explained and where applicable support from either the literature or the preceding surveys will be provided.

*1. Status:*

| Status |
|---|
| *P - ft wage* |
| *C- contract* |
| *S - self emp* |
| *CS - s'emp contract* |

The purpose of the first variable was to obtain data on changes in employment status over the course of a career. The response options used were established with reference to the results from the human resource survey. This segment of the data collection was seen as providing an opportunity to compare movement between IS and non-IS career streams. Two underlying reasons support the interest in such information. The first was the seemingly above average incidence of contract employment in the IS industry. This was highly visible in the volume of contract IS appointments offered in the newspapers. Further, in the limited results from the human resource survey, with only one exception, the number of contract appointments and permanent positions were equally represented. The second reason stems from developmental career theory (Super 1984) which predicted a trend to stabilisation towards mid career. This created the assumption that as graduates progressed towards this stage, regardless of career stream, permanent appointments should become the dominant form of employment status.

*2. Industry:*

The second variable, industry, required respondents to indicate for each position the business focus of their employer. While, in the context of this research this variable was not proposed for immediate application, it was included to provide a source of data for future research activity. Based on the problems identified from the human resource agency survey results, an open approach to this question was adopted. A further assumption here was that it was also highly likely that many early graduates entered a more limited scope of business focus, than those graduating in more recent times. For example, when computers were first commercially introduced in Australia the installations were limited to education, banking, and insurance organisations (Kiegler *et al.* 1986). Given the rapid diffusion of information technology, an expectation was of a widening scope in the business focus of organisations employing IS personnel.

In particular, this aspect of mobility related to the acknowledged 'transportability' (Friedman 1990) of skills possessed by IS professionals. The implication was that these are not industry specific, therefore, potentially there was an opportunity for comparison between IS and non-IS career streams.

*3. Position title:*

| **Position title** |
|---|
| *job title (not government position grade)* |

In support of the IS orientation of this research the aim of the position title variable was to enable comparisons to identify any emerging common patterns of IS career paths. This had a basis in the IS career literature, more specifically, in relation to the limited availability and scope of career paths for IS personnel (Tanniru 1983) and the notion of dual career paths (Chesebrough & Davis 1983).

*4. Computing professional:*
This variable was based on a yes/no response to differentiate between IS and non-IS appointments making up the career histories of respondents. Obviously, this provided the foundation to classify responses into one of the three career streams defined in this research. The approach of requiring respondents to indicate whether or not each appointment involved an IS role was purposefully adopted. During the IS recruitment survey it became apparent that a number of job titles, in the absence of task descriptions, were ambiguous. Requiring graduates to supply this information eliminated any need for the researcher to make judgments, and so not only reduced the time spent coding but, ensured the accuracy of this data.

*5, Employment duration:*

| Employment duration *(approximately)* | |
|---|---|
| *Appointed* | *Time* |
| *(year)* | *(months)* |

Employment duration had a two-fold objective. Firstly, should labour market conditions at a particular time become of interest it would enable the linking of employment data and the corresponding period in the results of the newspaper advertisement survey. Secondly, as identified in the research design, chronological ordering was an essential aid to the accuracy of human memory recall (Dex 1991). The inclusion of duration further assisted this process and at the same time provided a finer level of detail when duration of an appointment was under review in the second research question. The word approximately was used in an attempt to elicit completed responses to this question.

*6. Organisation:*

| **Organisation** | |
|---|---|
| **Type** | **Size** |
| *pub* | *S < 21* |
| *GBE* | *M 21 -100* |
| *pri* | *L 101 +* |

The organisation variable gathered data to address mobility both from a business sector and also a size perspective. These form a common theme in the two research

questions. Both were divided into three predefined categories which were established with reference to the results from human resource survey and also as a consequence of the peer review during the development of the career survey. The reasons for excluding the name of employer organisations have been provided in an earlier section. The space limitations of the CV format was a further practical reason to support this exclusion.

The last two variables from Part 1 of the graduate survey relate to career mobility.

*7. Job location*

| **Job location** |
|---|
| *Australia = give state* |
| *Overseas = give country* |

The first of these was directly related to one of the major issues within both research questions, geographical mobility. In the first it provided information of the scope of travel involved in the careers reported by graduates. For the second research question, it also addressed a local issue, the commonly held view that many graduates from the University of Tasmania are forced to relocated outside Tasmania to establish their careers.

*8. Reason for changing job*

| **Why job change?** |
|---|
| *I= internal move* |
| *E=external move* |
| *O=other move* |

This final variable allowed the identification of intraorganisational and interorganisational movement. It follows that the results obtained from this segment of the graduate career survey would serve to identify change of employer and also vertical and horizontal career movements. The approach adopted in this question was purposefully simple. While Slater (Slater 1979) identified six major reasons motivating the career movements of librarians, these were not necessarily mutually exclusive and each involved a number of issues. As a result, it was not possible to gain much of an insight into the mobility patterns of these workers.

#### *4.7.3.5 Part 2 - structure*

The primary objective of Part 2 of the graduate career survey was to gather data to address the second research question which was dedicated to the initial post-graduation appointment. Part Two followed a more conventional questionnaire format and contained eleven questions. In keeping with a strategy to encourage participation by limiting the size of the questionnaire, these focussed on the major issues associated with this stage in a career.

In Chapter Two the integral nature of the initial post-graduation appointment in career history studies has been described. In particular, considerable evidence has been established to support that experiences in this period were of significant influence during subsequent career decisions and outcomes (Thompson, Baker & Smallwood 1986). In addition, the inclusion of a life milestone such as first position has also been acknowledged as an essential and important component to assist the

accuracy of retrospectively collected data based on human memory recall (Baker 1991).

#### *4.7.3.6 Part 2 - content*

*1: Have you held paid, full time employment since completing your degree?*

The first question aimed to eliminate respondents who, at the time the survey was administered, had not yet entered full time paid employment. Graduates who indicated a negative response were further queried to determine whether they were currently seeking employment, had continued on to post-graduate study or had other reasons that precluded their inclusion in the paid work force. They were then thanked for their participation and instructions were provided for the return the survey.

*2: How did you obtain this position?*

Question two was based on a multiple choice format and respondents were reminded that more than one category could be involved. This was based on the following options:

- uni careers office;
- extension of existing part-time/casual employment;
- approach from an organisation (other than an existing employer);
- personal connections;
- newspaper advertisement;
- other (give details).

The aim of this question was to examine the means graduates applied when seeking their initial appointment and also to compare for any changes over time. In particular, during the course of piloting some of the earliest graduates, it appeared that during campus recruitment often a number of positions were offered, and the initial appointment was simply based on choosing the preferred employer. The responses to this question were also seen as the means of obtaining the importance or otherwise of newspaper advertisements as a form of graduate recruitment.

*3: Was your acceptance of this appointment based on any of the following reasons?*

Question three was also offered respondents multiple choice and again, a number of responses could be involved:

- career prospects;
- location;
- opportunity to work with leading edge technology;
- the organisation;
- training opportunities;
- travel opportunities;
- salary;
- other (give details).

This question has a two-fold purpose. The primary objective of this question was to follow through on the reasons why a particular position was accepted. As noted in Chapter Two, Arnold and Mackenzie Davey (Arnold & MacKenzie Davey 1992) described these are very relevant issues in relation to this period in a career. To recap, this research found that respondents viewed long term career prospects ahead of training and inherently interesting work. Salary and benefits, early responsibility and the particular organisation were rated even less important. Within this sample also, location was the least important criteria. This last result was of special interest in the context of the current research because of the situation with Tasmanian graduates and their reportedly high geographical mobility.

The second objective was to identify 'stop gap' appointments which could potentially have lead to erroneous results when duration within the initial appointment were calculated. The potential flaws in the data were pre-empted in the research design, and this question provided the means of minimising the impact on the accuracy of the results due to non applicable appointments. Consequently, one of the assumptions of this research is that for some graduates, their first full time post-graduation position reported may not represent the actual foundation of their professional careers. That is, to support their livelihood while seeking an appointment in their chosen field, they may have been forced to accept any job available. It could be argued that the future career decisions have been established as largely based on experiences gained during the initial career position. However, many of these appointments do not require skills and knowledge based on tertiary qualifications and also because they are accepted as temporary measures to obtain a source of income, the ability to effect future professional careers would be insignificant.

*4: Were formal qualifications required for this position?*

This question focussed on the extent to which tertiary qualifications have been a prerequisite for IS appointments over the twenty year period. The aim was to explore the emergence of IS as a profession in the traditional sense (Morrison 1969).

*5: Give details of the qualification requirements for this position:*

This question followed from the previous one to determine the area of qualification and whether or not this was considered a mandatory or a preferred prerequisite for the position on offer. In particular, the objective was to consider the range of qualifications acceptable for entry into the IS profession and whether, over time, computer science or information systems tertiary qualifications had emerged as dominant prerequisites. The question provided the opportunity to gauge the progress in the development of IS as a profession in its own right.

The next four questions were based on the model of Thompson (Thompson, Baker & Smallwood 1986) which determined that challenge, contribution, performance and learning new skills were regarded as four highly influential factors during the initial appointment of professionals. The outcome of experiences in these areas were said to have implications for subsequent career decisions. Each of these questions was based on a two-part probing format. That is, where a graduate reported experiencing one of

these situations, then the issue was further pursued to determine what constituted challenge, contribution, performance and learning new skills.

While these questions are beyond the scope of the immediate research, as explained earlier, at the time of the sampling they were regarded as maximising the economies of scale to obtain data projected for a future extension of this study.

*6: While in this position do you recall being given career counselling?*

The first part of this question determines whether the graduate was given the benefit of career counselling during that stage in their career. The second sought more details of the form of counselling provided. In particular, when it was provided, meaning a single session or during regularly scheduled meetings. Career counselling is important because it offers employees an opportunity to obtain the necessary information to allow them to review their current situation and formulate long term career goals (Callanan & Greenhaus 1990).

*7: While in this position do you recall being given an opportunity to demonstrate your capabilities with challenging tasks?*

This question aimed to find if graduates recalled being given any opportunity to demonstrate their capabilities during their initial career appointment. It has been established earlier in this thesis that this is a crucial component at this stage of a career with the ability to govern future career performance (Kaufman 1974).

*8: While in this position did you receive any formal training?*

This question focussed on whether training was provided when engaged in this initial position. It is an important factor in an early career as inclusion in training has been identified as carrying a powerful message (Sonnenfeld 1989), particularly from a perspective the willingness of an organisation to invest in human capital (Barney & Lawrence 1989); (Sicherman & Galor 1990). A further issue to support the inclusion of this question is that Kieger (Kiegler *et al.* 1986) reported a decline in the extent of training provided in large organisations. When computing was first introduced most of the training was provided in the more sizable companies. Many small organisations were either unwilling or not in a position to provide training and so the head hunting of personnel from large organisations became a common practice. This occurred to the extent that many larger organisations discontinued providing professional development to its personnel for the benefit of smaller companies.

*9: While in this position was your performance formally assessed?*

The aim of this question was to consider another important area in a career. Throughout the career literature, especially in vocational guidance this is widely acknowledged as highly desirable because it provides feedback to employees who are often unable assess their standing in an organisation. It also provided the opportunity for goal setting which can be beneficial to both employer and employee. For the latter in particular it can act as a motivator by extending the scope or challenge of what a position entails.

*10: Describe any positive outcomes from starting your working career in this position*

*11: As best you can recall, describe any negative outcomes from starting your working career in this position*

The final two questions in Part 2 of the graduate career survey sought to gather data in relation to the positive and negative feelings graduates recall from their experiences in this initial appointment. This information offers an opportunity to determine experiences common to specific business sectors and different size organisations. In addition, results from the reason for change variable allow a follow through on the extent to which graduates subsequently remained in an organisation or moved to a new employer.

### 4.7.4 Method

The graduate career survey was subjected to a two level pilot process.

#### *4.7.4.1 Peer review*

The first level pilot involved meetings with University lecturers and peers to obtain feedback on the structure, content and perceived level of difficulty. These resulted in a number of revisions, in particular the response categories and instructions for respondents.

#### *4.7.4.2 Pilot graduate survey*

In the second pilot the initially revised survey, was distributed to ten graduates. These were 7 males and 3 females representing mostly Bachelor of Science degrees awarded between 1978 to 1990. Of these, 3 were currently employed in the ACT, 1 each in New South Wales and South Australia, with the remaining 5 were resident in Tasmania. Eight pilot graduate career surveys were mailed to participants and a personal meeting arranged with two local graduates. One completed the survey over a lunchtime meeting and provided oral feedback during this time. The second inspected the survey but declined to complete it on the spot, as this graduate wanted to refer to his CV which was not held in at the business location. This survey was subsequently returned with all the questions completed together with a list of comments and suggestions.

Because the feedback from the pilot survey did not necessitate any major adjustments, the data obtained from these respondents were included with that obtained from the main graduate career survey. Minor, superficial, changes were effected, chiefly to make the requirements of the survey more easily determinable.

#### *4.7.4.3 Graduate career survey*

The graduate career survey was distributed to 679 graduates. This sample was extracted from the graduate database based on the criteria established within this research. That implied only graduates who gained a bachelor degree which included a major in either computer science or information systems. The remaining records in the database (just over 25%) referred to graduates whose home country was overseas, or others who enrolled in post graduate research or graduate diploma courses based on a degree from another institution.

Practical and financial reasons forced the decision to omit graduates who completed their bachelor degrees at the University of Tasmania as overseas students. Basically the lack of availability and access to resources precluded any attempt to locate current contact addresses for these graduates. The high risk of a low response and the significant cost, involved to attempt to include these graduates in the survey, both in terms of human labour and postage, could not be justified.

In addition, there was also a small number of graduates who, despite applying all the means outlined later in this chapter, proved untraceable.

A destination breakdown of the survey mail out is shown in Table 4.3. The total target sample distribution involved 83% male and 17% female graduates. It should also be noted that the small percentage of surveys sent outside Australia were to expatriate graduates, and those for whom it had been possible to determine their current residential addresses.

**Table 4.3: Graduate career survey geographical distribution**

| **Destination** | **n=679** |
|---|---|
| | % |
| Tasmania | 58.8 |
| Victoria | 13.3 |
| New South Wales | 10.9 |
| Australian Capital Territory | 8.2 |
| Overseas | 4.6 |
| Queensland | 1.9 |
| South Australia | 1.2 |
| Western Australia | .9 |
| Northern Territory | .3 |

The graduate career surveys were posted on June 30th, 1997. A return date of 17th July was indicated both on the information sheet at the front of this document and also in the accompanying information pamphlet. This time frame was established based on discussions with University careers office staff, who are highly experienced in administering graduate surveys. The reason for setting a deadline of this length was to avoid creating a negative reaction to the survey by demanding an unreasonable turnaround. At the same time, the period was not so extensive as to encourage the recipient to put the survey aside for future attention and subsequently be overlooked.

For Australian resident graduates, the survey was accompanied by a return addressed, reply paid envelope. Postings to destinations outside Australia in contained one postal international reply coupon (IRC). This is an internationally exchangeable coupon that the minimum postage for a priority item or an unregistered letter sent by air to a foreign country.

To facilitate the compilation of demographic results and eliminate duplications during a proposed reminder mail out, each survey carried the unique student identification number issued to graduates upon enrolment at the University of Tasmania. This served to provide a means of identifying respondents from non respondents, it also provided a link to the demographic results already held in the graduate database and most importantly, it maintained confidentiality.

Five days after the initial deadline reminder notices were sent to 422 graduates who, at that time, had not returned their surveys. There was considerable overlap in this period. Surveys returned within the period up to the follow up mail out were coded as early responses and these accounted for 76.4% of the overall responses finally received.

#### *4.7.4.4 Descriptive pamphlet*

The final and minor area of activity within this research involved the design and development of an information pamphlet to be accompany the graduate career survey (Appendix 6). A number of reasons supported this approach. Primarily there was an assumption that most people would read a pamphlet. Based on experience and perceptions from the human resource agency survey, an official formal introductory letter was not considered the most effective way to enlist support for a research project. In addition, a pamphlet provided an economical form of conveying information.

The pamphlet was developed and subjected alongside the graduate careers survey to a peer review and pilot. In content it specifically addressed the following issues:

- an explanation of the research using an informal question/answer approach;
- an explanation of what participation would involve including a time estimation of time to complete based on the results of the graduate pilot survey;
- a description of a reward offered as an incentive to participate;
- a contingency should the wrong person be contacted;
- information of contact details.

## 4.8 Department of Computer Science graduate database

One of the most labour intensive activities in this research was the establishment of a graduate database. This was an essential component to provide a target sample population of graduates as defined within this research. In addition, it provided a background to support the planned categorisation of the results from a number of perspectives. The ready availability of information from this source such as the year of graduation, degree, etc., allowed the graduate career survey to be shorter, more accurate and also, importantly for eliciting responses, seen as less personally intrusive by recipients. In addition, the graduate database was seen as establishing a source of reference for future work. For example, it could be used to support an on going, longitudinal survey based on this initial retrospective survey.

Within the guidelines of the University Human Ethics Committee the initial graduate information was supplied from the central records held by the University Student Administration section. In effect, this meant that there was an agreement to protect the confidentiality of the information provided and also that it would be used specifically only for the purposes of research. The data supplied from this source was based on the selection of graduates who gained a major in either computer science or information systems, while enrolled in either science or non science degrees. This

search was conducted independently of the researcher who therefore had no control over the extent or completeness of the information supplied.

During the undergraduate period many students had moved between courses and streams of study. It became apparent from a preliminary reading of the supplied graduate records, that in many examples when students varied enrolment, course majors were not always adjusted to reflect these changes. In addition, at times over the twenty year period the weighting value of some of the same name course electives had been changed. Consequently, to determine those meeting the criteria of an undergraduate major at the third year level in either computer science or information systems necessitated an inspection of each student record.

For this purpose reference was made to the University of Tasmania undergraduate degree handbooks published between 1978 and 1995. These are produced annually as a guide for enrolling students and for the purposes of this research provided a historical source of changing course requirements including the value of the individual units offered in a particular year. The selection process that followed involved checking with each record provided by administration with the weighting of electives as it applied at the third year level of study (Appendix 7).

Converting and standardising this 'raw' data for entry into the database proved to be an extremely labour intensive process. The data from student administration was supplied in two parts and in separate formats. The first included personal graduates information of detailing previous surname, last known postal address, date of birth, gender and full fee paying (FFP) status. This data was provided in computer based spreadsheet format. The more comprehensive student records describing individual enrolment details, course results, transfers and awards was provided electronically in rich text format (RTF) and also as a hard copy.

### 4.8.1 Configuration of the database

The information contained in these records was assembled to establish a relational database using the Microsoft Access database software application. This is structured on the following tables:

*Graduate:
(student Id, surname, previous surname, given names, title, date of birth, FFP status, gender, residence, street, suburb, state, country, postcode)

Degree:
(student Id, bachelor degree 1, year bachelor degree 1, bachelor degree 2, year bachelor year 2, stream, given majors (1&2), credited majors (1&2), graduate diploma 1, year graduate diploma 1, graduate diploma 2, year graduate diploma 2, honours, year honours, masters, year masters, PhD, year PhD)

Course:
(student Id, year, unit code, result)

Unit:
(year, unit code, name of unit)

Award:

(counter, student Id, surname, year, award)

*where (underline) indicates the key fields

*Additional fields*

The graduate database contains three new fields of data beyond that supplied by student administration. All are contained within the Degree Table. The first is an indicator of the stream of study to provide an ease of differentiating between computer science (CS) and information technology (IT) major records. The second and third were established to record the findings of the selection process outlined earlier. These recorded 'given' majors and 'credited' majors to distinguish between those taken from the actual review of records and those from the student administration data. The data as supplied by student administration was still retained in its original form, alongside an unofficial upgrade necessary to facilitate this research project.

The original graduate database contained just over seven hundred graduates with a further two hundred added in 1996 when it was updated to include the most recently graduated. Based on the application of the selection criteria established within this research, Table 4.4 shows the degrees represented in the graduate database. Of these, the Bachelor of Computing graduates is a newly recently degree available in the Department. Of the total of 920 records at present contained in the database 732 are male and 188 female graduates. However, for reasons explained earlier in this chapter, it was neither practical or possible to involve all in the graduate career survey.

**Table 4.4:Bachelor degrees of graduates making up the graduate database**

| **Award** | **n=920** |
|---|---|
| | % |
| Bachelor of Science | 61.7 |
| Bachelor of Commerce | 10.0 |
| Bachelor of Arts | 7.3 |
| Graduate Diploma of Science | 7.0 |
| Bachelor of Engineering | 6.6 |
| Bachelor of Surveying | 2.7 |
| Bachelor of Economics | 2.5 |
| Bachelor of Computing | 1.7 |
| Bachelor of Laws /Bachelor of Science | .4 |

### 4.8.2 Updating graduate contact details

Once the graduate database was established, the next task was to upgrade as many records as possible with regard to changes in names and addresses. Because of the twenty year time frame involved, in the case of women graduates it was reasonable to expect that a number had married and as a result, many had changed their surname. During the course of updating names it became evident that a small number of male graduates had also changed their surnames. It could not also be assumed that the address shown in the student administration records was a current valid contact address. In addition, in many of these records the address data was simply a null field or the record listed address as unknown.

A number of avenues were explored to achieve this upgrade. These involved:

- contacting the Australian Computer Society;
- making personal contacts within the Department;
- use of e-mail;
- a search of Telstra White Pages on the internet world wide web (WWW);
- personal contact with parents and relatives;
- a search of the Australian electoral roll;
- approaching the University alumni office.

#### *4.8.2.1 Australian Computer Society*

Although an obvious source of information for graduates pursuing IS dedicated careers, the Australian Computer Society was unable to provide assistance. The policy of the society both at the national and branch level was to reject requests for such information.

#### *4.8.2.2 Personal contacts*

Initially a personal approach to staff and postgraduates within the Department provided a starting point as many had either maintained contact, or an awareness, of the current situation of many graduates. When the accuracy of this information was established, where possible these graduates were also approached for assistance in locating fellow graduates. This proved a fruitful exercise as it established a network trace of graduates which included both name and address changes. While again contact often involved a personal approach, e-mail proved an effective tool enabling cost-free world wide communication.

#### *4.8.2.3 Telstra Whitepages*

The Telstra Whitepages on the internet provided another source of data in respect to geographic location. There are three major disadvantages associated with attempting to locate people via a telephone directory. The first two are true for both the on-line and hard copy versions. Firstly, the information is too broad, that is, it is not possible to search actual given names. While a match of the initials of given names narrows the search, the situation is made more difficult because, depending on the information provided by the subscriber, many listings display only a single first name initial. So without incurring considerable time and cost by actually phoning all the resultant matches it is almost impossible to accurately find people through this source.

Secondly, with either mode of search potentially the information is out of date. Currently both forms are based on the latest annually produced printed copy and while the electronic version has the potential to provide real time information, at present it has not been developed to this capability. In addition for the on-line search where many matching entries may be involved it is necessary to narrow the search to a specific district. If follows that when details of even a suburb, yet alone a street, are not known, the search has little chance of success.

This is not meant to imply that the application of electronic Whitepages was a complete failure, for some worthwhile results were obtained. However, these were mainly limited to less common or unique surnames or where it was used to confirm a known location. A more positive side is that the web Whitepages did make it faster

and easier to access Australia wide telephone subscribers by removing the need to source, then manually scan a number of telephone directories.

#### *4.8.2.4 Telephone contacts*

In relation to Tasmania a positive spin off was it proved an easy search of residential phone numbers. Often this provided an opportunity to talk with the parents or relatives of graduates to obtain upgraded contact information. Sometimes there was the added bonus that these people would also be aware of the current whereabouts of their children's University peers. However, the economic constraints of the project limited this procedure to within Tasmania.

When telephoning parents, for ethical reasons and to also encourage disclosure of this information, in the introductory conversation the name and University contact phone number of the research supervisor, Dr C.D Keen, was always offered. With only one exception the people contacted were willing to assist and were generally forthcoming in providing information. In addition a compromise was also negotiated with three parents who, while unwilling to provide information, agreed to forward on the graduate survey. So as far as Tasmanian contacts were concerned, the searching of the electronic Whitepages indirectly contributed to upgrading many graduate details.

#### *4.8.2.5 Australian electoral roll*

The third means of upgrading the graduate database with respect to current residential addresses involved a search of the Australian electoral roll. In Hobart this information is stored on a statewide basis on microfiche and is available for public access at the State Library of Tasmania and also at the offices of the Australian Electoral Commission. In the State Library four microfiche machines are available while the Electoral Commission offer the use of only a single reader. The latter made it quite clear that any monopolisation of this resource was discouraged so the initial search over four full days was carried out in the State Library. As a more efficient means of handling the transcription process a portable PC borrowed from the School of Information Systems was used to store the data electronically.

While this search was highly productive it was also labour intensive. Even though in this format full christen names are listed, again there was no financially cost-free (given the financial constraints of the project) way of confirming that the data obtained were actually the graduate being sought. An added problem arose when there were multiple listings for the same Christen names and surnames. There was also a very real drawback that even in event of a single entry match, it was again impossible to conclude that this person was actually the graduate sought. The methods of addressing the problem of approaching the wrong person are described later in this chapter when the design of the information pamphlet is discussed.

When it was found that the microfiche available at the Electoral Commission was a more recent version than that held at the State Library, a final search was conducted at that site. Due to the limited reader facilities this was undertaken over five day period.

#### *4.8.2.6 University of Tasmania Alumni*

By applying these procedures many graduate records were updated. While an initial approach for assistance to the University of Tasmania Alumni was unsuccessful a second contact made with the primary aim of gaining financial sponsorship towards postage, support was forthcoming. Consequently, the very last upgrade of graduate contact information came from an exchange of data with the Alumni Office. This was beneficial to both parties with much of the information complementing that held by the other.

*Database work yet to be completed*

The University of Tasmania released a new set of unit codes in 1995 many of which retained the existing course titles. It had already been established during the setting up of the original Department of Computer Science database that, at different times in the past, course names had been changed while the course code remained unaltered. For example in an Economics degree between 1979 to 1984 the code CEC202 referred to an elective titled *theory of the firm*. Post 1984 the same coding then became *intermediate microeconomics*. To address this and maintain the accuracy of individual course details throughout the years contained in the database, a unit table was added to the database configuration. This necessitated multiple key fields to link year, unit and course name. In the establishment of this table, Student Administration again assisted by providing a listing of the year linked to numerous electives undertaken by graduates listed in the database.

In the initial database this table was already very large as for many graduates it was not uncommon to have attempted 25 or more units during their undergraduate studies. For example, for 700 graduates in the initial database this resulted in a course table containing 23,013 rows of data linked to 4130 entries in the unit table. Based on this experience and an awareness of the considerable amount of work involved this component of the graduate database has been temporarily halted. Because the research reported in this thesis is not dependent on this aspect of data this upgrade has been scheduled for future attention.

## 4.9 Data analysis

The aim of this final section is to briefly introduce two aspects in relation to the analysis of data within this research. These will be elaborated in greater detail, when applied in the presentation of the result of this research in the next two chapters. The first is the analytic frameworks specifically developed to enable a structured approach to the analysis of the data obtained from the graduate career survey. Following the recommendation of Slater (Slater 1979) frameworks were constructed to guide the analysis for each of the two research questions. The first of these will be presented to precede the analysis of Research Question One in Chapter Five. The second will follow in Chapter Six, wherein the results for Research Question 2 are reported.

The second issue in relation to the data analysis in this research is that of event history analysis. As will be explained in Chapter Six, this approach overcomes a fundamental problem that can arise when attempting consider the duration of the initial post-graduation appointment. From reference to the literature, although there is little evidence in the IS career literature (apart from an undefined application of right censoring (Wagner & Benham 1993)), event history analysis has been

identified as an appropriate technique to accurately determine this result (Allison 1984); (Devine 1998); (Willett & Singer 1991); (Yaffee & Austin 1994).

## 4.10 Summary

This chapter focussed on the presentation and explanation of the methodology applied in this research. Initially the three phases of data collection conducted during this research were described and then the approach used in each substantiated with reference to Neuman (Neuman 1991). It was established that, while primarily the aim of the first two phases was to support the IS orientation in the third, and major phase, Phase Two was also projected as capable of supporting independent research.

Essentially, following on from the earlier review of career theory, broader career research and IS career research, the design, development and application to data collection was undertaken in recognition of the following issues. These have applied:

- multiple forms of data collection: survey questionnaires and content analysis;
- cross sectional and retrospective longitudinal data collection;
- the development of purposefully constructed questionnaire instruments;
- the application of a structured CV, with particular attention to prompting the precision of human memory recall;
- an acknowledgment of the inclusion of data in relation to the initial post graduation appointment;
- a focus to enable comparisons between IS and non-IS career outcomes and mobility patterns;
- a recognition of the need for a structured approach and the development analytic frameworks;
- event history analysis to reliably deal with censored and uncensored data;
- the establishment of a graduate database to enable comparisons of career outcomes based on a benchmarked sample.

Chapter Five is the first of two chapters reporting the results of this research. It is dedicated to demographic results and also the results relevant to Research Question 1 posed in this thesis.

# CHAPTER FIVE: results relevant to Research Question 1

## 5.1 Introduction

The primary objective of this chapter is to present the results with a specific focus on the first research question posed in this thesis. Broadly, the following issues will be addressed, the:

- response rate achieved from the graduate career survey;
- validity with respect to respondents and non-respondents;
- demographic results;
- analytic framework;
- results for research question one.

Chapter Six will report the results in relation to the second research question.

## 5.2 Graduate career survey response

The response rate of the graduate career survey was 44%. Of the 679 graduate career surveys distributed, 58 were returned to sender as address unknown. A further 16 were discounted from the returns when 4 graduates declined to participate, 2 surveys were returned on behalf of graduates temporarily residing overseas, 5 responses were unusable and 5 questionnaires were sent to non graduates. Of the remaining 605 surveys a total of 267 valid returns were received.

This outcome, for the major data collection in this research, more than favourably compares with the extent of returns for mailed questionnaires reported in the IS literature. Importantly, it is almost the same as the 44% response rate reported by McLean, Smits and Tanner (McLean, Smits & Tanner 1996) in their seminal work in IS careers. It is also well within the range reported in other areas of IS research. For example, in the Australian IS literature, figures varying between 17.4% (Klobas & McGill 1992) to about 25% (Watson 1989) are quoted as acceptable. Outside this country the level of responses reported are typically even more wide ranging. From a sample of just over one thousand DPMA members, Igbaria and Greenhaus (Igbaria & Greenhaus 1991) achieved a 36.9% return. Richards and Pelley (Richards & Pelley 1994) reported 29%, while in a much larger targetted sample population, Dengate, Couger and Weber (Dengate, Couger & Weber 1990) obtained a 9.2% response in a survey accompanying 14,500 copies of an American industry journal, Professional Computing.

## 5.3 Validity of career survey returns

To establish the representativeness of the sample contributing to the data obtained from the career survey, an analysis was conducted to determine potential differences between respondents and non respondents. Ensuring the similarities between these two groups is regarded as a problem that most researchers are not able to satisfactorily solve (Watson 1989). Chi-squared tests of independence were

conducted on four perspectives of location, gender, degree and graduation cohort between the 267 valid responses received and the remaining 343 non respondents.

The outcome of these tests support no significant difference between respondents and non respondents with respect to present geographic location, degree and graduation cohort. For degree, the computed value p = 3.223 is < (at =5df $\chi^2$ $\alpha$ = 0.95 p = 11.07) supporting the null hypothesis of no difference between respondent and non respondent graduate groups. This is also true for graduation cohort (p = 2.568) is < (at =3df $\chi^2$ $\alpha$ = 0.95 p =7.815). In addition, there is no significant difference between the two groups with respect to their current geographic location: (p = 4.627 is < (at =5df $\chi^2$ $\alpha$ = 0.95 p = 11.07). In relation to this last aspect, so as not to violate the minimum $\chi^2$ 5 cell value, an 'other' category was constructed to represent the combined data with respect to Australian states where only a small number of graduates are to be found. In effect this combined the figures for graduate populations in Western Australia, South Australia, the Northern Territory and Queensland.

However, the chi-squared test showed a significant difference when gender of the respondent and non respondent groups was tested (p = 9.26818 is > (at =1df $\chi^2$ $\alpha$ = 0.95 p = 3.841). An inspection of the raw data revealed that this outcome relates to the fact that, proportionally, more female than male graduates participated in the graduate career survey.

## 5.4 Demographic results

This section of the chapter presents some demographic results of relevance in the context of this research. This will establish a profile of the graduates whose career data contributes to the main results to follow later in this chapter. The characteristics of respondents are broadly viewed according to gender, geographic location, degree and graduation cohort. Each will be pursued to a greater level of detail with descriptions at the sub category level and, where appropriate, interactive effects examined. The proposed outcome of this process will provide a foundation to facilitate the presentation of the research results.

### 5.4.1 Respondents by gender

Of the 267 graduates who participated in the career survey 205 or 78% are males and 62 (22%) females. This imbalance is unavoidable, given that historically, enrolments in the Department of Computer science have been dominantly male students. Obviously, this imbalance will be a common theme evident throughout the results where a division by gender is involved.

### 5.4.2 Current geographic distribution of respondents

The second demographic result focusses on the geographic location of graduates at the time they completed the career survey. Figure 5.1 graphically depicts the geographic location of the 267 respondents.

Reflecting the high percentage of graduates resident in Tasmania (53.2%) at the time of the mail out, overall just over half of the responses were received from this state. Adjusting the original mail out figures to take into account dead letters and other miscellaneous exclusions, this represents a 37% response rate for this location.

Victorian based graduates contributed just under 15% of the data reported in the survey results. Approximately half of those targetted in this state responded to the questionnaire. Overall just over 10% came from each New South Wales and the ACT where response rates of 43% and 52% consecutively were achieved. The three remaining Australian states where responses were received are Queensland, South Australia and Western Australia. No replies were received from the Northern Territory where two graduates were thought to be located.

The 6.7% responses from outside Australia represent a 57% participation rate from expatriate graduates. Returns were received from Canada, Hong Kong, Indonesia, Japan, the Philippines, Singapore, Sweden, the United Kingdom, the USA and in one simply defined as Central Europe. One survey was returned from the USA as 'address unknown'. This was sent to a business address and, obviously, the nominated recipient had changed employer.

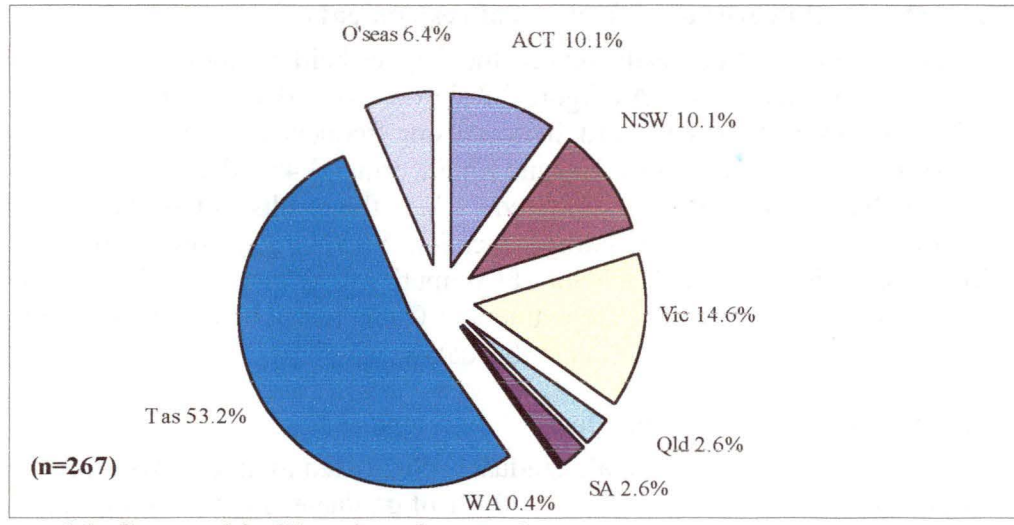


**Figure 5.1: Geographical location of respondents**

### 5.4.3 Current geographic location and gender

Figure 5.2 describes the current residential location of graduates representing the proportions according to division by gender in the total sample group. Of the 78% of male graduates just over half (51.2%) and 61.3% of the 22% female respondents were located in Tasmania. For women, in decreasing order of frequency, 12.9% live in New South Wales, 11.3% are in Victoria and 8.1% in the ACT. For male graduates Victoria is the second most popular destination (15.6%), followed by the ACT and New South Wales where 10.7% and 9.3% respectively are resident. Constructed to combine areas with only minor representations of graduates in the 'other' destination category. This includes Queensland, South Australia, Western Australia as well as overseas countries. Of the male graduates 7.3% were employed outside Australia as also were just over 3% of the women graduates. Responses from graduates of either gender were received from the remaining Australian states with the exception of Western Australia, where one male graduate participated in the survey.

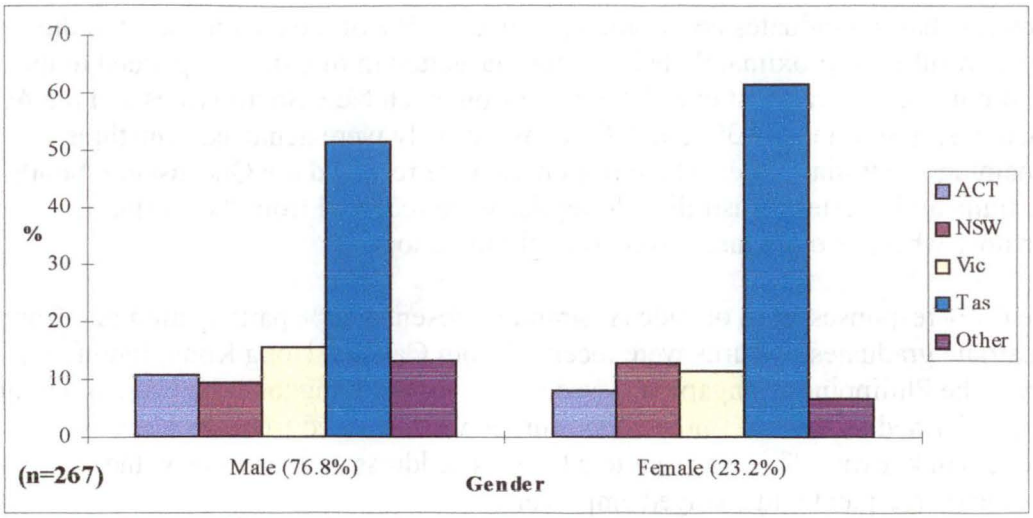


**Figure 5.2: Geographic location of respondents by gender**

### 5.4.4 Bachelor level degree qualifications of respondents

This part of the demographic results reports the degrees held by graduates responding to the career survey. As Figure 5.3 shows, over 70% of respondents achieved a Bachelor of Science award. In decreasing frequency follow Commerce (9.7%), Arts (8.6%), Economics (3.7%) and Engineering (3.4%) degrees. The other category, which percentage-wise contributed 4.5% to the results, is based on awards with only minor representation including Education, Surveying, a combined Bachelor of Laws/ Science and Bachelor of Computing. The last listed degree has only recently been available in the Department of Computer Science which in part explains its very limited representation in this dataset.

### 5.4.5 Degree qualification and gender

Reflecting the gender imbalance, male graduates dominated in all but Arts and Economics degrees. As Figure 5.3 shows, 70.1% of graduates in this sample were awarded a Bachelor of Science of which, approximately one quarter (14.2%) were women. From the total percentage of 9.7% gaining a Bachelor of Commerce, 8.6% were male. More women graduates held a Bachelor of Arts. They comprised 5.6% of the total of 8.6% participants from this discipline. The economics degree (3.7% overall) was equally divided between male and female graduates. No women graduates holding Engineering, Education, Bachelor of Laws/Science or Surveying degrees participated in this survey.

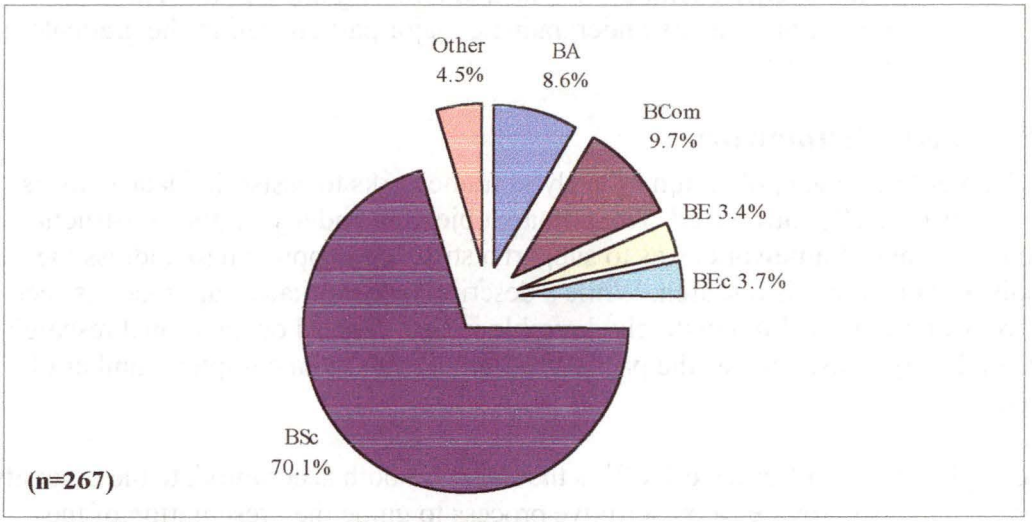


**Figure 5.3: Bachelor degrees of respondents**

### 5.4.6 Department of Computer Science major

To differentiate this sample according to one of the two undergraduate streams offered within the Department of Computer Science, from the 76.8% male graduates, nearly 69% (185) completed a computer science major at the third year level and just under 8% (20) information systems majors. For the 23.2% of women participants, 15.4% (41) hold a computer science major and 8% (21) gained accreditation in information systems.

### 5.4.7 Demographic summary

The following are highlights from the demographic results:

- reflecting the long standing gender imbalance of enrolments in the Department of Computer Science, a majority of respondents were male graduates;
- more than half the responses received came from graduates resident in Tasmania;
- while more than 50% of male graduates participating in the graduate career survey were resident in Tasmania, this proportion was even higher for female graduates (61%);
- among graduates no longer resident in Tasmania, for male graduates Victoria has been the most popular work destination, whereas more female graduates have relocated to New South Wales;
- Bachelor of Science is the dominant degree held by participants;
- other degrees represented in the sample are Bachelor of Arts, Commerce, Economics, Engineering, Computing, Education, Surveying and Bachelor of Laws/Science;
- of these degrees Computing, Education, Surveying and Bachelor of Laws/Science have only minimal representation in the sample;
- Bachelor of Arts degrees are more highly represented by women graduates;

- an almost equal number of male and female graduates from an information systems undergraduate major participated in the graduate career survey.

## 5.5 Analytic framework

In Chapter Four, the application of analytic frameworks to assist the data analysis process was briefly introduced. The primary objective underlying the construction and use of these frameworks was to support a structured approach to address the results obtained in this research. While a descriptive, quantitative approach is seen as not only appropriate, but positively desirable in broad-based occupational research (Slater 1979), it also creates the problem of how to address a complex number of issues.

The application of a framework offers the means to both accommodate the diversity of data, and also provides a prescriptive process to guide the presentation of the results. This approach is seen as beneficial both for the analyst and also the reader. For the researcher, the framework provides a point of reference to incorporate many perspectives of data. It also provides the reader with a direction map that serves to flag progress during the analysis of these results. In so doing this approach fulfils one of the stated outcomes of this thesis. That was, to provide a practical insight into the career experiences of this graduate group accessible by a wide audience of readers, whose interest may be focussed in different areas of career information.

Frameworks were constructed to specifically address each of the two research questions. Table 5.1 presents the first framework which addresses Research Question One. Within this four levels of analysis will be conducted, namely:

- Level 1 - overview;
- Level 2 - between graduation cohorts;
- Level 3 - between career streams;
- Level 4 - between career streams within graduation cohorts.

The first perspective provides a broad overview of the results which involves data from both the graduate career survey and, where appropriate, that from the IS recruitment newspaper survey. The subsequent three perspectives each build on the preceding one to provide increasing levels of detail so that different aspects of the results can be considered.

The second level introduces the notion of time and provides the outcomes for the different periods when graduates embarked on their careers and the varying lengths of work histories involved. Issues related to career stream and positional involvement are purposefully excluded at this level. These form the basis for the next division of the data when yet another perspective is examined in the third level.

Level 3 retains the cohort configurations and expands the results to now include the effects over time within the three careers streams defined for the purposes of this research. Once again, the IS recruitment results offer an additional, relevant insight. The fourth, and final, level is inwardly focussed and looks at the results for the three career streams within each of the five graduation cohorts.

**Table 5.1: Research Question 1 - analytic framework**

| *Q1: With a particular focus on career and work history mobility, what are the career experiences of graduates from the Department of Computer Science at the University of Tasmania who gained a bachelor degree based on a major in either computer science or information systems?* | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Level 1(§5.6): Overview** | | | | | | | | | | | | | | | |
| Career stream | IS | | | | | Hybrid | | | | | Non-IS | | | | |
| *Career focus* | | | | | | n.a. | | | | | | | | | |
| *IS role involvement* | | | | | | | | | | | n.a. | | | | |
| IS labour market recruitment | | | | | | | | | | | n.a. | | | | |
| (Geographic distribution IS recruitment) | *The Australian* | | | *The Age* | | | *The Mercury* | | | | n.a | | | | |
| Work history mobility | | | | | | | | | | | | | | | |
| **Level 2 (§5.7): Between graduation cohort** | 1. CS ≤1980 | | | 2. CS 1980-1985 | | | 3. CS 1986-1990 | | | 4. CS 1991-1995 | | | 5. IS 1991-1995 | | |
| Work history mobility | | | | | | | | | | | | | | | |
| **Level 3 (§5.8): Between career stream** | | | | | | Hybrid | | | | | Non-IS | | | | |
| | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| Career stream | | | | | | n.a. | | | | | | | | | |
| *Role involvement* | | | | | | | | | | | n.a. | | | | |
| Work history mobility | | | | | | | | | | | | | | | |
| (IS labour market recruitment) | | | | | | | | | | | | | | | |
| **Level 4 (§5.8): Between graduation cohort** | 1. CS ≤1980 | | | 2. CS 1980-1985 | | | 3. CS 1986-1990 | | | 4. CS 1991-1995 | | | 5. IS 1991-1995 | | |
| Career stream | IS | Hyb | Non | IS | Hyb | Non | IS | Hyb | Non | IS | Hyb | Non | IS | Hyb | Non |
| Work history mobility | | | | | | | | | | | | | | | |

(shading indicates IS recruitment data)

## 5.6 Level 1: overview analysis of the results for Research Question 1

*With a particular focus on career and work history mobility, what are the career experiences of graduates from the Department of Computer Science at the University of Tasmania who gained a bachelor degree based on a major in either computer science or information systems?*

This question was purposefully designed to make a contribution to the dearth of IS personnel research by addressing the two major problematic characteristics frequently reported in relation to the IS industry. Firstly, the chronic shortage of skilled IS personnel (Igbaria & Greenhaus (1992a); Cameron 1991) and secondly, their perceived higher job mobility compared with other workforce sectors (Bartol & Martin 1983). To this end the focus on career in Research Question 1 aims to establish the extent of IS career involvement of graduates and also the alternative careers they pursue. Work history mobility encompasses career movement between business sectors, different sized organisations, geographical destinations of employment and patterns of job mobility.

### 5.6.1 Career stream

To initiate the prescribed analytic process proposed in Table 5.1, the extent to which graduates have been involved in each of the three career streams is reported. The results are then further elaborated on the basis of gender and bachelor degree qualifications. These distinctions are pursued as they are seen as offering some insight into the potential associations between undergraduate major, degree and gender as a determinant of career choice. In responding to the research questions, the results are based on an adjusted sample size of 258 cases. This was necessary to reflect the fact that at the time the survey was administered, nine graduates has not yet embarked on their careers and were either seeking work or else had enrolled in post graduate study.

The career stream categories have been established by dividing the data into one of the three possible career streams defined within this research. The IS career stream is made up of those surveys where all the positions reported were defined by the respondent as IS focussed. Conversely, the alternative non-IS career stream results are based on data where graduates indicated that at no stage in their careers have they been employed in an IS professional capacity. The hybrid stream describes career histories when graduates have engaged in both IS and non-IS related appointments.

Figure 5.4 shows the grouping of graduates by career stream. More than half (55.8%) of the respondents were engaged in careers dedicated to working solely as IS professionals. Of the remaining 45%, a slightly higher percentage (24.0%) at some stage in their careers had also been employed in this role, while a further 20.2% had followed non-IS related careers.

To further enrich the above results, three additional aspects of the results in relation to career will now be presented. The first combines career stream according to gender, then reconsiders these results in light of the bachelor degree qualifications.

The second additional perspective examines the actual focus of careers either in the IS or non-IS industries. That is, what are the patterns of career focus in the work histories of graduates reporting an IS career. This process of analysis is then repeated to determine the career areas that graduates who have taken up non-IS careers. To conclude this section, the extent of involvement in the various positional roles in the IS industry of graduates reporting dedicated IS careers and hybrid careers are examined.

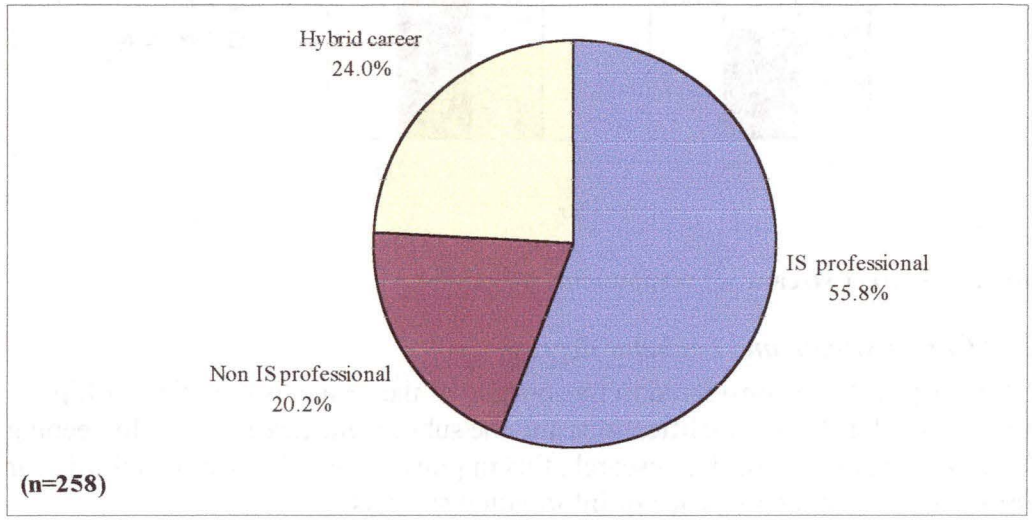


**Figure 5.4: Graduates grouped by career stream**

### *5.6.1.1 Career stream and gender*

Based on the adjusted sample size of 258 responses, divided by gender, the data described in this section comprises 78% male and 22% female respondents. Viewed from this perspective (see Figure 5.5) the career stream results show that a higher percentage of male graduates (59%) than female graduates (46%) reported careers dedicated solely to working as IS professionals. When non-IS and hybrid careers are considered, 27% of the female graduate sample have followed a non-IS related career compared with 19% of males engaging in a similar occupational pursuit. Women graduates are also more highly represented in the hybrid career category. Of the female graduates responding to the survey, 28% reported working intermittently as IS professionals whereas only 23% of the male graduates described this as their career path.

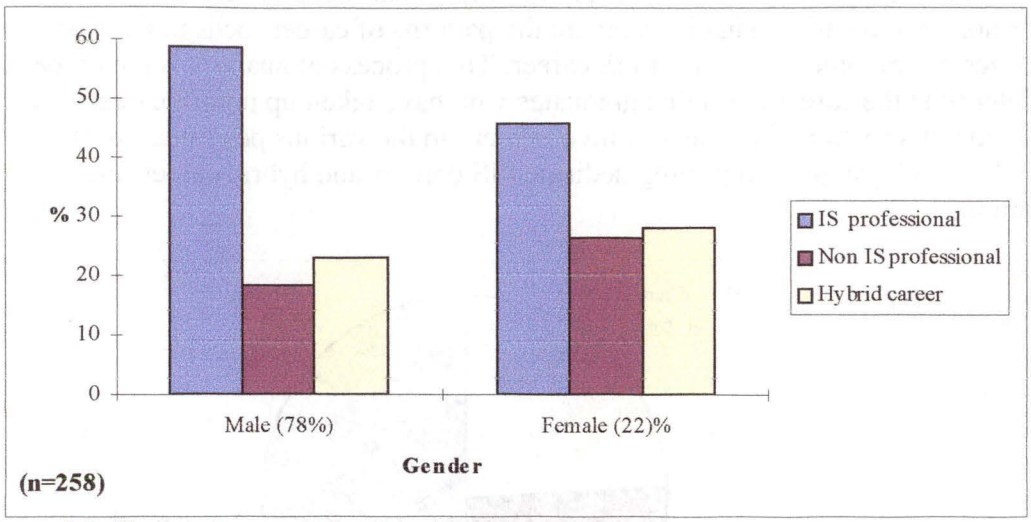


**Figure 5.5: Career streams of respondents by gender**

### *5.6.1.2 Career stream and bachelor degree*

The final aspect to be considered in this portion of the results is the relationship between bachelor degree qualifications and the subsequent career focus. In keeping with the scope defined for this research, this implies an award based on a third year major in either computer science or information systems.

In these results two degrees are not depicted as both each refer to only one graduate. The first gained a Bachelor of Education and reports a career history involving employment in the IS profession. The second graduate was awarded a combined Bachelor of Laws/Science and has subsequently continued to a career in the legal profession.

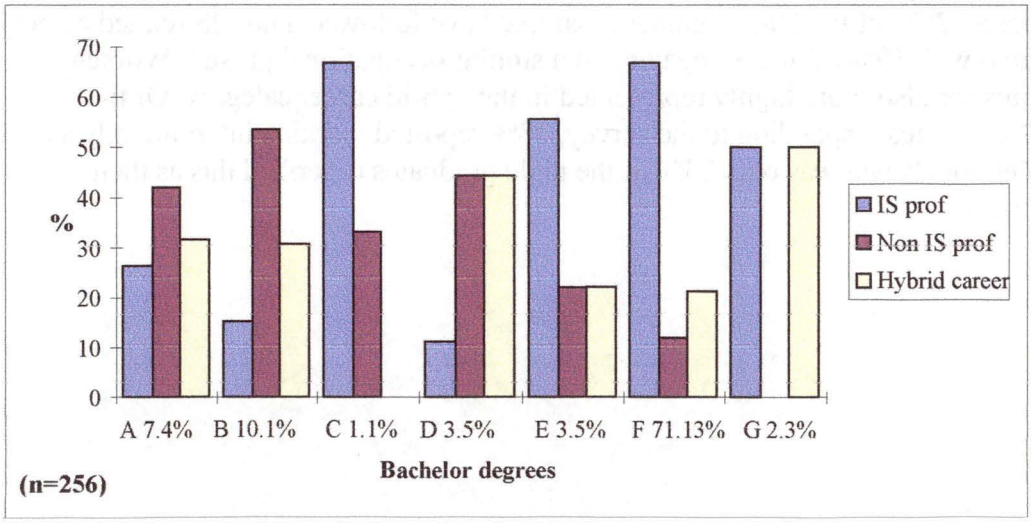


**Figure 5.6: Career stream by bachelor degree**

**Legend:**

A: Bachelor of Arts
B: Bachelor of Commerce
C: Bachelor of Computing
D: Bachelor of Engineering
E: Bachelor of Economics
F: Bachelor of Science
G: Bachelor of Surveying

As Figure 5.6 shows, for this graduate sample, a career as an IS professional has more often been associated with Bachelor degrees in Science, Computing or Economics. Arts, Commerce and Engineering degrees tend to have supported non-IS career paths. However, in so reporting it is necessary to note the extent of the distribution of these degrees. In particular the Bachelor of Computing (1%) and, to a lesser extent, the Bachelor of Surveying (2.3%) have only minimal representation. As a very recently available award the Bachelor of Computing results refer to just three responses of which two graduates are working as IS professionals while the third is employed in a non-IS related area.

Within the degrees reported by graduates, with only one exception, at least 20% of graduates from each of these disciplines have engaged in a hybrid career stream. What is interesting about this result is that the degree with the minimum percentage of involvement in the dual career role is the Bachelor of Science. While nearly 70% of these graduates have pursued careers solely focussed in the IS profession, only 12% reported work histories involving a hybrid career stream.

### 5.6.2. IS career focus

Table 5.2 shows the areas of IS focus described in the career histories of graduates whose careers are based on working solely as IS professionals. As stated earlier, with more recent graduates the limited extent of their careers to date means that these results are not seen as conclusive, but rather as indicators based on the role patterns contained in the more longstanding career histories.

**Table 5.2: IS career focus**

| **Career** | |
|---|---|
| | ( n=144) |
| | % |
| systems development | 25.8 |
| management | 21.6 |
| CSO (computer systems officer) | 9.7 |
| programming | 8.4 |
| consultant | 6.3 |
| network | 6.3 |
| support | 4.2 |
| academic | 3.5 |
| analyst/programming | 3.5 |
| database | 3.5 |
| software engineering | 2.6 |
| technical | 2.1 |
| graphical information systems | 1.4 |
| internet | 0.7 |
| marketing | 0.7 |

This table identifies that of the 144 careers making up the IS career stream, just under half have been classified as focussed in either systems development or management. In addition, 9.7% were identified as CSO appointments which can only be assumed to describe careers solely based in the public sector. CSO is a government positional role, computer systems officer, which is a generic title encompassing a range of IS related activities. Even though it was attempted to obtain data that better reflected the comparable role in the public sector, unfortunately in a

large number of responses the instructions in this regard were ignored. Consequently, it is not possible to gain any further insight into the actual focus of the careers so classified.

Slightly less than 8.4% of graduates, have spent their entire careers working in a programmer capacity. Careers focussed on working as IS consultants have also proved a popular choice among these graduates. Further career areas include those focussing in analyst/programmer, GIS, Internet, marketing, support and systems.

### 5.6.3 Non-IS career focus

This section reports the areas of career involvement for those graduates following alternative, non-IS related careers. Again, because the careers for the most recent cohorts are in their initial stages, these are also presented as indicative results.

Table 5.3 shows the extent of distribution between eleven career categories plus one additional 'other' based on seven work histories, where it was impossible to identify any specific career focus. This shows that just over one third of the careers have been in an academic environment. For the purposes of this research, this describes both the tertiary and the school educational systems. To a lesser extent, and reflecting a link with degree qualifications, graduates are also pursuing accounting, engineering, financial, legal and psychological oriented careers. The results for the officer career focus (as distinctive from CSO) described in this career stream are based on appointments, which were indicated by respondents as non-IS appointments. This result can only be taken at a superficial level as implying public sector orientated careers. Finally, even fewer graduates have embarked on careers directed at the insurance, marketing, manufacturing and welfare industries.

**Table 5.3: Non-IS related career focus**

| Non-IS career focus | |
|---|---|
| | (n=52) |
| | % |
| academic | 36.5 |
| accounting | 13.5 |
| other | 13.5 |
| engineering | 9.6 |
| finance | 9.6 |
| marketing | 3.9 |
| officer | 3.9 |
| insurance | 1.9 |
| law | 1.9 |
| manufacturing | 1.9 |
| psychology | 1.9 |
| welfare | 1.9 |

### 5.6.4 IS role involvement

The extent of involvement in IS occupational roles is based on data from all respondents to the career survey. That is it is not limited to those who have followed a dedicated IS career, but also includes positions reported by graduates who have intermittently worked as IS personnel. As Table 5.4 shows, this has resulted in a total of 706 IS positions which have been classified into 32 IS occupational roles.

Overall, nearly one quarter of these appointments have involved working as a programmer. The combined role of analyst/programmer was the second most frequently reported position, accounting for a further 17.1% of this sample. IS management was represented to the extent of making up 13.1% of the appointments. IS consulting, engineering, support and analyst positions all contributed between approximately 5% to 6% of the appointments contained in the graduate career histories. A slightly smaller percentage of graduates also worked as a DBA (database administrator) or leader. Apart from the CSO category, the remaining 22 appointments are based on only minimal positional involvement.

**Table 5.4: IS and hybrid career streams IS positions**

| Title | |
|---|---|
| | (n=702) |
| | % |
| programmer | 24.2 |
| analyst/programmer | 17.1 |
| manager | 13.1 |
| CSO | 7.3 |
| consultant | 6.3 |
| engineer | 5.7 |
| support | 5.1 |
| analyst | 4.8 |
| DBA | 2.7 |
| leader | 2.6 |
| academic | 1.6 |
| coordinator | 1.6 |
| administrator | 1.4 |
| director | 1.1 |
| other | 1.1 |
| graduate trainee | 1.0 |
| specialist | 1.0 |
| architect | 0.4 |
| supervisor | 0.4 |
| auditor | 0.3 |
| scientist | 0.3 |
| trainer | 0.3 |
| communicator | 0.1 |
| license management service | 0.1 |
| systems strategist | 0.1 |
| technical document writer | 0.1 |
| webmaster | 0.1 |

### 5.6.5 IS labour market recruitment

By way of comparison, the results of role vacancies from the IS recruitment survey are shown in Table 5.5. These results reflect the demand representative of the Australian IS labour market across a 20 year time frame, and are based on a sampling of 2891 IS recruitment classified advertisements.

Table 5.5 shows that in addition to a minor, 'other', category at a broad level, 20 IS roles were identified. The distribution of the demand in these results reveals that 80% was focussed in five IS positions of which 48% are almost equally divided between programmer or analyst/programmer appointments. The three remaining main areas of IS employment are manager, analyst and CSO. A further 9 IS positional titles relate

to areas of minor demand which vary from engineers (3.3%) down to auditor (1.1%). Less that 1% of the overall demand describes the final 7 job categories and in addition an 'other' category based on a minimal amount of unclassifiable data.

**Table 5.5: Positions IS recruitment newspaper survey**

| Title | |
|---|---|
| | (n=2891) |
| | % |
| programmer | 24.3 |
| analyst/prog | 23.8 |
| manager | 11.6 |
| analyst | 11.0 |
| CSO (computer systems officer) | 8.0 |
| engineer | 3.3 |
| administrator | 2.6 |
| leader | 2.3 |
| support | 2.0 |
| consultant | 1.8 |
| specialist | 1.6 |
| professional | 1.5 |
| DBA | 1.3 |
| auditor | 1.1 |
| designer | 0.9 |
| coordinator | 0.8 |
| academic | 0.7 |
| director | 0.7 |
| supervisor | 0.4 |
| technologist | 0.2 |
| other | 0.1 |

### *5.6.5.1 A regional perspective of IS recruitment*

The extent of demand for IS positions based on the division of the IS recruitment results, according to the three publications sampled, were considered in order to examine the regional distributions of demand. Table 5.6 shows the results when arranged in this format and shows that eleven IS positional titles were in common demand and that the opportunities for employment in the remaining ten appointments varied. Of the former, when the four most required are examined, this reveals that while the top two vacancies again were for programmers or analyst/programmers, in Tasmania the demand for programmers was more than double that for the combined A/P role. Further, in this state, and supporting the high involvement of IS focussed graduates in the public sector, officers (CSOs) were required to the same extent as programmers. Here the demand was nearly three times those offered in *The Australian* or *The Age*. The remaining eight common appointments relate to the role of administrator, analyst, consultant, director, engineer, manager, professional and supervisor.

**Table 5.6: Positions IS recruitment 1975-1995 by regional perspective**

| Title | *The Australian* | *The Age* | *The Mercury* |
|---|---|---|---|
| | (n=2132) | (n=691) | ( n=68) |
| | % | % | % |
| academic | 0.9 | | |
| administrator | 2.4 | 3 3 | 1 5 |
| analyst | 11 2 | 11 1 | 5.9 |
| analyst/prog | 25.1 | 21.0 | 13.2 |
| auditor | 1 0 | 1 5 | |
| consultant | 1.7 | 1.7 | 2.9 |
| coordinator | 1.0 | 0.1 | |
| CSO | 7.3 | 8.1 | 27.9 |
| DBA | 1 4 | 1.3 | |
| designer | 0.9 | 1.2 | |
| director | 0.7 | 0 6 | 1 5 |
| engineer | 3.1 | 3.8 | 2.9 |
| instructor | 0.2 | | |
| leader | 2.3 | 2 8 | |
| manager | 11 7 | 11.4 | 8 8 |
| other | | 0.3 | 1.5 |
| professional | 1 2 | 2.0 | 4.4 |
| programmer | 24.9 | 22.1 | 27.9 |
| specialist | 1 7 | 1.3 | |
| supervisor | 0.2 | 1.0 | 1.5 |
| support | 1.1 | 4 9 | |
| technologist | 0 1 | 0.4 | |

### 5.6.6 Work history mobility

For the purposes of this research, work history mobility encompasses what represents the five major aspects related to a career. These are business sector, size of employer organisation, geographical location, positional mobility and the reason motivating career movement. At this overview presentation of the results, positional mobility will not be considered. Where appropriate in this portion of the results those from the IS newspaper recruitment survey will also be included to support the geographical aspects of the results.

#### *5.6.6.1 Distribution of graduate employment by business sector*

To introduce these results, the distribution of employment for these graduates has been almost equally divided between the two major business sectors. These results are presented in Figure 5.7. This shows that 47.5% of the career appointments of these graduates to date, have been in the private sector, while the public sector was responsible for 45% of career appointments. Of the remainder GBEs (government business enterprises) accounted for 6.8% and the final .7% describes appointments simultaneously carried out in a combination of business types. This last result indicates that only a very limited number of graduates have contracted their services between a multiplicity of business sectors.

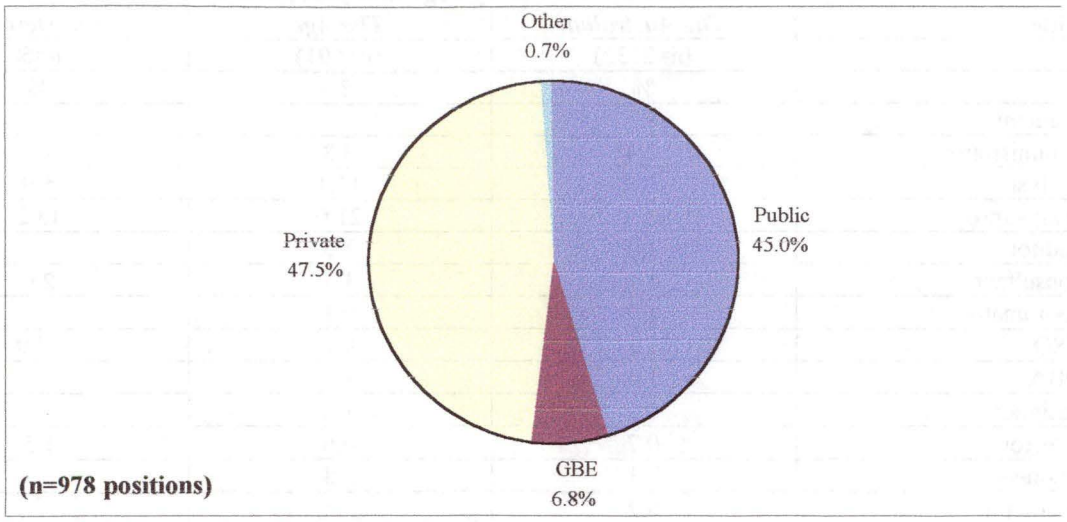


**Figure 5.7: Career involvement by business sector**

### *5.6.6.2 Distribution of graduate employment by size of organisation*

Table 5.7 shows the outcome when the data are further refined to describe the focus of employment according to one of three organisational sizes defined within this research. Because the results for the 'other' category examined earlier involves overlap across different sized organisations it has been excluded in this view of work history mobility.

While across all three sectors, large sized organisations have been the dominant employers, the results differ when medium and small organisations are considered. For both public and GBEs the percentage of appointments decreases incrementally between large, medium and small establishments. This is not so in the private sector where the second largest source of employment has been in small organisations where overall 13.7% of the appointments have been located.

**Table 5.7: Employment by business sector & organisational size**

| | **Public** | **GBE** | **Private** |
|---|---|---|---|
| | (n=436) | (n=67) | (n=467) |
| | % | % | % |
| large | 35.6 | 5.9 | 24.2 |
| medium | 8.3 | 0.7 | 9.3 |
| small | 1.1 | 0.1 | 13.7 |

* (total n reflects adjustment 8 non mutually exclusive business sector cases)

### *5.6.6.3 Comparison of distribution of graduate employment by business sector, size of organisation and career stream*

Table 5.8 presents these results when further divided into each of the three career streams defined in this research. From this perspective, the dominance of large public organisations as a source of employment for all three career groups is evident. In addition, while for graduates making up the IS career category, large private sector organisations have been the second most important source of employment, within the hybrid and non-IS career streams the prominent role of small organisations becomes apparent. However, at the same time for non-IS related careers the distribution between large and small organisations in the private sector is equally divided.

**Table 5.8: Business sector & organisational size by career stream**

| | IS career stream | Hybrid career stream | Non-IS career stream |
|---|---|---|---|
| | (n=556) | (n=295) | (n=127) |
| | % | % | % |
| **Public** | | | |
| large | 37.2 | 34.6 | 30.5 |
| medium | 7.7 | 7.2 | 13.3 |
| small | 1.1 | 1.4 | .8 |
| **GBE** | | | |
| large | 6.3 | 5.5 | 5.5 |
| medium | .5 | 1.0 | 1.6 |
| small | .2 | 2.7 | |
| **Private** | | | |
| large | 28.1 | 17.1 | 18.0 |
| medium | 8.5 | 11.0 | 12.5 |
| small | 9.4 | 19.1 | 18.0 |
| **Other** | 0.9 | 0.3 | |

### *5.6.6.4 Distribution of graduate employment by geographical location*

The next factor at the overview level looks at the geographical distribution of the employment activities of these graduates. These results will be presented according to two perspectives. Firstly, taken as a whole and secondly, divided according to career stream. This allows some insight into both the focus of work locations and the extent of mobility depending on the career focus (Table 5.9).

The initial results reveal that the range of Australian states and overseas countries graduates have travelled in the course of their careers is wide and involves a total of 31 locations. While there is considerable overlap in locations between the three classified career streams, there is also diversity. From this overview perspective of the geographical mobility results it is also worthwhile to compare the scope of travel between these career streams. Graduates making up the IS career stream reported a total of eighteen work destinations, for the hybrid career group 23 different geographical areas were recorded, while the alternative, non-IS career oriented graduates had worked in eleven locations.

Based on an adjusted total of 976 positions, Table 5.9 clearly shows that the commonly held view of limited employment opportunities for graduates in Tasmania could be open to question. Over half of the positions making up the career histories of these graduates were located in this state. Within the rest of Australia, Victoria (12.5%) was the second most popular work destination followed by New South Wales (10.5%) the ACT (10.1%) and Queensland (2.3%). There are only minimal reports of employment in the remaining States.

These graduates have also held positions in a total of twenty overseas destinations. Within these the UK has been most popular location abroad where a total of 58 appointments accounting overall for 5.9% of the proportion of work destinations.

**Table 5.9: Geographical distribution represented in the work histories of graduates**

| Location | |
|---|---|
| | (n=976)* |
| | % |
| Tasmania | 50.3 |
| Victoria | 12.5 |
| New South Wales | 10.5 |
| ACT | 10.1 |
| UK | 5.9 |
| Queensland | 2.3 |
| South Australia | 1.4 |
| USA | 1.3 |
| Aust wide | 1.1 |
| NZ | 0.8 |
| Japan | 0.5 |
| Canada | 0.3 |
| Switzerland | 0.3 |
| Germany | 0.2 |
| Hong Kong | 0.2 |
| Indonesia | 0.2 |
| NT | 0.2 |
| Singapore | 0.2 |
| WA | 0.2 |
| Antarctica | 0.1 |
| Asia | 0.1 |
| Belgium | 0.1 |
| Fiji | 0.1 |
| France | 0.1 |
| Malaysia | 0.1 |
| Netherlands | 0.1 |
| NT/PNG | 0.1 |
| NZ/Aust/Pacific | 0.1 |
| Philippines | 0.1 |
| Sweden | 0.1 |
| Tas/Ant | 0.1 |
| Thailand | 0.1 |

* adjusted to reflect 2 cases of missing data

### *5.6.6.5 Comparison distribution of graduate employment by geographical location and career stream*

When these data are divided according to the three career streams as defined within this research (Table 5.10), then further aspects of the results are revealed. That is, while Tasmania is again the dominant source of employment, this varies from the extent of nearly two-thirds of the appointments held by graduates pursuing a non-IS related career to less than half the positions reported by those following an IS career. In addition Victoria, New South Wales and the ACT have been the next most popular work destinations. However, for the hybrid career group, the third most popular work destination has been the UK.

**Table 5.10: Geographical distribution of employment by career stream**

| Location | IS career stream | Hybrid career stream | Non-IS career stream |
|---|---|---|---|
| | (n=556) | (n=293)* | (n=127) |
| | % | % | % |
| Tasmania | 42.4 | 60.9 | 65.4 |
| Victoria | 16.2 | 8.7 | 14.2 |
| New South Wales | 10.1 | 5.9 | 4.7 |
| ACT | 14.7 | 3.8 | 6.3 |
| UK | 5.7 | 8.3 | 1.6 |
| Queensland | 3.0 | 2.4 | .8 |
| South Australia | 1.7 | 1.0 | .8 |
| USA | 1.7 | 1.0 | |
| Aust wide | 1.7 | | 3.2 |
| NZ | 1.1 | | 1.6 |
| Japan | .4 | 1.7 | |
| Canada | | .4 | |
| Switzerland | | 1.0 | |
| Germany | .2 | .4 | |
| Hong Kong | | .4 | |
| Indonesia | .2 | .4 | |
| NT | | .7 | |
| Singapore | .4 | | |
| WA | .2 | .4 | |
| Antarctica | | .4 | |
| Asia | | .4 | |
| Belgium | | .4 | |
| Fiji | | .4 | |
| France | | .4 | |
| Malaysia | .2 | | |
| Netherlands | | | .8 |
| NT/PNG | | .4 | |
| NZ/Aust/Pacific | .2 | | |
| Philippines | .2 | | |
| Sweden | | | .8 |
| Thailand | | .4 | |

* adjusted to reflect 2 cases of missing data

#### *5.6.6.6 Reasons for change*

Overall, positional mobility is based on a total 717 appointments recorded in the career histories that graduates have vacated to move to their current appointment. This shows that 41.7% of movement occurred because of external reasons, 36.4% for internal change and the final 21.9% were defined by graduates as due to 'other' causes.

### 5.6.7 Level 1: overview summary

In addressing Research Question One, the results at a broad level of analysis can be summarised as follows. In keeping with the definition of career as established at the beginning of this thesis these are presented divided into the two major areas of interest, career and work history mobility. From an overview perspective, the results show that:

*5.6.7.1 Career*

- a majority of graduates have, at some stage in their careers, have been employed as IS personnel;
- more than half of graduates have followed a dedicated IS career;
- more than half of the male graduates have pursued dedicated IS careers, while approximately a further one quarter have intermittently worked in an IS capacity;
- just under half of the female graduates have engaged in careers solely in the IS profession, while in excess of a further quarter have been employed in IS appointments at some stage in their careers;
- the central career focus for those following IS careers has been in systems development or IS management: together these two areas accounted for just under half of the 144 IS career paths identified;
- nearly half of the IS positional involvement reported by graduates was based in either programmer or analyst/programmer roles;
- the central IS role involvement in these two roles reflects that reported in the literature (Cameron 1991) and also largely from the results of demand gauged through the IS recruitment survey;
- while the results from the sampling of *The Mercury* supported the high demand for programmers, the extent of this was equal for computer systems officers. This is seen as a regional effect for Tasmania with its high graduate involvement in the public sector;
- the IS and non-IS positional involvement for graduates making up the hybrid careers has been almost equally divided between these two streams of employment;
- for graduates following alternative, non-IS related careers, there was some evidence of a link between area of bachelor degree qualification and subsequent career. For example, degrees awarded in engineering, accounting, finance, law and psychology;
- for graduates following alternative, non-IS related careers, the major career focus has been in the academic area, which encompassed both the tertiary and school education systems.

*5.6.7.1 Work history mobility*

The second component of Research Question One addresses the work history mobility of these graduates. As defined at the beginning of this thesis work history mobility implies business sector involvement, geographical relocation, duration within specific appointments and change between employer organisations. The broad Level 1 analysis of this portion of the results has revealed that:

- the career involvement of graduates regardless of career focus has been almost equally divided between the public and private sectors;
- when the size of organisation was examined, then large public sector organisations have accounted for nearly one third of the career involvement of graduates, while a further one quarter has been in large private sector companies;
- overall, in the course of their careers graduates have worked in a total of 31 locations;
- in Australia, the major destination has been Tasmania to the extent of

representing just over half of the appointments reported;
- outside Australia, at this overview level the UK had been the most popular overseas work destination for graduates;
- by career stream, Tasmania has varied from representing under half the appointment by those in the IS career stream, 61% of positions in the hybrid stream increasing to represent almost two thirds of the career roles reported by graduates engaged in alternative, non-IS careers;
- when graduates have relocated outside Tasmania, within Australia this has tended to be in the larger population centres, New South Wales or Victoria;
- at this broad level of analysis, external career moves have been the most commonly cited reason for leaving positions, 36% were due to internal career movement with 'other' cause reported in the remaining 22% of work histories.

## 5.7 Level 2: analysis of results between graduation cohorts

At this second level of analysis of the results for Research Question One, a time perspective is introduced when responses to the graduate career survey are classified according to graduation cohort. Here the aim is to distinguish both the different periods when graduates entered the labour force, and also to acknowledge the varying extent of the career histories involved. Within this section, the results will be limited to work history mobility. The aim of this approach is to initially establish a general insight into patterns of graduate career movement and to then introduce results of career focus at the subsequent level of analysis. This level 2 analysis does however include results of positional mobility, an outcome that was not relevant at the previous overview presentation of the results.

The cohort classifications were established with reference to the student records contained in the graduate database. These are based on four, five year periods and with one exception they coincide with the periodic sampling time frames applied during the collection of IS employment data. The 1975 sampling conducted in the newspaper survey predates graduations from the Department of Computer Science which was established only one year earlier.

Therefore, in this section of the results, graduate responses are now grouped within the following time frames:

- Cohort 1 ($\leq$ 1980);
- Cohort 2 (1981-1985);
- Cohort 3 (1986-1990);
- Cohort 4 (1991-1996);
- Cohort 5 (1991-1996).

It should be noted that in the most recent period, two cohorts are involved. These share a similar time frame but differentiate between graduates from either a computer science or information systems background. Respondents classified in the information systems cohort represent the original group to graduate from the Department of Computer Science since this stream was introduced in 1987.

Similarly, Cohort 1 reflects the career histories of the initial graduates from the Department who gained bachelor degrees based on a third year level computer science major.

### 5.7.1 Respondents grouped by graduation cohort

Figure 5.8 provides a view of the data when arranged according to this perspective. This shows that overall almost half of the responses (44.6%) came from those graduating in the 1991-1996 cohorts accounting for 28.5% and 16.8% respectively. As explained earlier the two undergraduate streams of computer science and information systems are separately represented in these cohorts. Of the remainder nearly one third (30.7%) were received from people graduating with a computer science major between 1986 and 1990 (Cohort 3). Graduates defined within Cohort 2 (1981-1985) contributed 18.38% of the data while the remaining 6.4% came from the original group to graduate from the Department (Cohort 1).

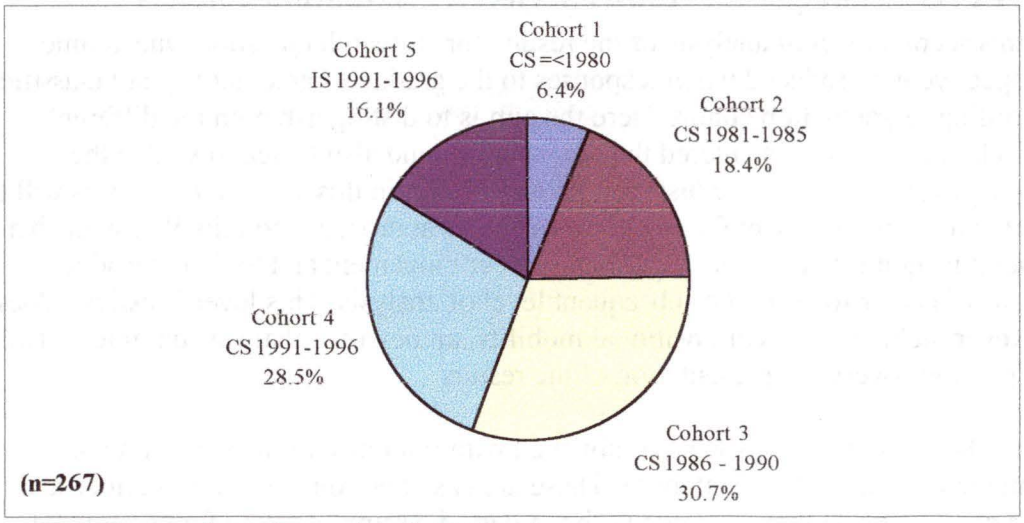


**Figure 5.8: Respondents by graduation cohort**

### 5.7.2 Work history mobility

At this second level of the results mobility involves all five aspects potentially describing work history mobility. In this instance, however, sector, organisation size, geographical location, duration and reasons for change are presented in relation to graduation cohort results.

#### *5.7.2.1 Distribution of graduate employment: business sector by cohort*

As already established at the overview level, broadly, graduate career activity has been almost equally divided between the two major business sectors and that within these the largest proportion of positional opportunities has been focussed in large organisations.

Table 5.11 reports these results when divided by business sector and classified according to graduation cohorts. This shows that for three of the five graduation classifications, the public sector has been the major source of employment. For the second graduation cohort, this sector has provided 58.1% of the positions reported by this group, while Cohorts 1 and 4 recorded 55.3% and 48.7% appointments

respectively. For Cohort 4 the difference between their career involvement in public or private organisations is only marginal with approximately 3% variation between these two sectors.

The exceptions to a public sector career orientation are Cohort 3 and Cohort 5. For the larger part of their careers these graduates have been employed in the private sector. For the first of these, in excess of 56.2% of the positions making up their career histories have been in private organisations and for the initial information systems graduation cohort (Cohort 5) the proportion is even higher (58.8%).

Over time the emergence and increased employment opportunities in GBEs (apart from the results for Cohort 4) is also evident.

The 'other' category relates to positions that graduates have described as being simultaneously undertaken between multiple combinations of organisational types. Such cases refer to contractual appointments. Based on the results the graduates participating in the graduate career survey reported only a minimal involvement in this type of employment and this has been limited to those graduating post 1985.

**Table 5.11: Business sector by cohort**

| Sector | Cohort 1 | Cohort 2 | Cohort 3 | Cohort 4 | Cohort 5 |
|---|---|---|---|---|---|
| | (n=103) | (n=260) | (n=336) | (n=194) | (n=85) |
| | % | % | % | % | % |
| **Public** | 55.3 | 58.1 | 33.0 | 48.7 | 30.6 |
| **GBE** | 1.9 | 6.2 | 9.6 | 4.6 | 9.4 |
| **Private** | 42.7 | 35.8 | 56.2 | 45.6 | 58.8 |
| **Other** | | | 1.2 | 1.0 | 1.2 |

### *5.7.2.2 Distribution of graduate employment: size of organisation by cohort*

The results presented in Table 5.12 show the distribution of graduate employment when further differentiated according to small, medium and large sized of organisations. Presented in this format, it is evident that for four of the five cohorts, regardless of whether in the public or private sector the major focus of employment has been in large sized organisations. The exception relates to Cohort 4 where the dominant source of employment has been in small organisations. As this same size of organisation has also proved a secondary source of graduate employment for Cohort 3 and Cohort 5, there is some indication of a trend in more recent times for small private businesses to be emerging as an increasing source of career opportunities.

**Table 5.12: Business sector & organisation size by cohort**

| Sector/ | Cohort 1 | Cohort 2 | Cohort 3 | Cohort 4 | Cohort 5 |
|---|---|---|---|---|---|
| **Organisation** | (n=103) | (n=260) | (n=336) | (n=194) | (n=85) |
| | % | % | % | % | % |
| **Public** | | | | | |
| large | 39.8 | 45.4 | 26.1 | 40.5 | 25.9 |
| medium | 13.6 | 11.2 | 6.3 | 7.2 | 3.5 |
| small | 1.9 | 1.5 | 0.6 | 1.0 | 1.2 |
| **GBE** | | | | | |
| large | 1.9 | 4.6 | 9.3 | 4.1 | 5.9 |
| medium | | 1.2 | 0.3 | 0.5 | 3.5 |
| small | | 0.4 | | | |
| **Private** | | | | | |
| large | 26.2 | 23.8 | 29.1 | 12.8 | 29.4 |
| medium | 9.7 | 5.0 | 10.8 | 12.3 | 11.8 |
| small | 6.8 | 6.9 | 16.2 | 20.5 | 17.6 |
| **Other** | | | | | |
| | | | 1.2 | 1.0 | 1.2 |

### *5.7.2.3 Distribution of graduate employment: geographical location by cohort*

The geographic mobility of graduates provided in the previous section will now be considered in more depth to also account for the time dimension in these results. The outcome is presented in Table 5.13 which identifies graduates making up Cohort 3 have reported the widest distribution of locations: in total 30 destinations are involved. This is far higher than in the remaining cohorts where there are variations from 6 destinations for Cohort 5 up to 13 distinct work locations reported in the career histories within Cohort 3.

Across all five cohorts, Tasmania has been the site of the majority of the appointments making up the career histories of these graduates. Nearly two thirds of the total positions reported by graduates making up the two most recent cohorts have been in this state. In addition approximately half of the total positions in Cohort 1 and Cohort 2 have also been in Tasmania. Further, in what seems the most highly mobile group, 37% of the positions reported by graduates classified within Cohort 3 have also been in this state.

Over time, the ACT has decreased as a source of employment for graduates when grouped according to graduation cohorts. For the two earliest cohorts, the ACT provided between 16.5% to 18.5% of the overall appointments within each of these groups. However for the subsequent three graduation cohorts this percentage has reduced to 6.6%, 5.6% and 1.2% consecutively for Cohort 3, Cohort 4 and Cohort 5. With some exceptions career involvement in Victoria and New South Wales has increased, particularly among graduates making up the third graduation cohort.

Outside Australia, during the twenty year sample period, the majority of appointments have been in the UK. For the original computer science graduation cohort this destination represented nearly one quarter of the appointments making up their combined career histories. In addition the UK, although to a lesser extent, has also been the sole overseas work destination among graduates in Cohort 5.

**Table 5.13: Employment by geographical distribution & cohort**

| Location | Cohort 1 | Cohort 2 | Cohort 3 | Cohort 4 | Cohort 5 |
|---|---|---|---|---|---|
| | (n=103) | (n=258) * | (n=336) | (n=194) | (n=85) |
| | % | % | % | % | % |
| Tasmania | 48.5 | 51.5 | 37.2 | 65.1 | 65.9 |
| Victoria | 1.0 | 13.1 | 18.0 | 9.7 | 9.4 |
| New South Wales | 5.8 | 4.2 | 16.2 | 9.2 | 15.3 |
| ACT | 16.5 | 18.5 | 6.6 | 5.6 | 1.2 |
| South Australia | | 0.4 | 2.7 | 2.1 | |
| WA | | 0.4 | 0.3 | | |
| Queensland | 1.0 | 1.9 | 4.2 | 1.0 | |
| NT | | | 0.3 | 0.5 | |
| Aust wide | 1.0 | | 1.8 | | 4.7 |
| UK | 24.3 | 4.2 | 3.9 | 4.1 | 3.5 |
| Singapore | 1.0 | | 0.3 | | |
| USA | 1.0 | 2.7 | 0.6 | 1.5 | |
| NZ | | 1.5 | 0.6 | | |
| Canada | | 0.8 | 0.3 | | |
| NZ/Aust/Pacific | | 0.4 | | | |
| Asia | | 0.4 | | | |
| Malaysia | | | 0.3 | | |
| Philippines | | | 0.3 | | |
| Indonesia | | | 0.6 | | |
| Antarctica | | | 0.3 | | |
| NT/PNG | | | 0.3 | | |
| Tas/Ant | | | 0.3 | | |
| Hong Kong | | | 0.6 | | |
| Germany | | | 0.3 | 0.5 | |
| Japan | | | 1.5 | | |
| Switzerland | | | 0.9 | | |
| Belgium | | | 0.3 | | |
| Fiji | | | 0.3 | | |
| Thailand | | | 0.3 | | |
| France | | | 0.3 | | |
| Netherlands | | | 0.3 | | |
| Sweden | | | | 0.5 | |

*adjusted to reflect 2 cases of missing data

The results for positional mobility and reasons for change offer further insights into the career movement of these graduates. From this graduation cohort perspective, it allows comparisons of the extent of mobility across the four cohort time frames, and additionally, between computer science or information systems majors. The reasons for change add a further dimension to the results by quantifying career moves according to interorganisational and intraorganisation positional movement. To briefly recap the main reason supporting the inclusion of a third 'other' category was to maximise responses to this section of the graduate career survey by offering respondents a non personally intrusive option.

### *5.7.2.4 Positional mobility by cohort*

Table 5.14 shows the average number of positions according to graduation cohort.

When the data are viewed from this perspective, it shows an incremental increase in the average number of positions across the cohort classifications. This ranges on average from less than 3 appointments being recorded by those classified in the two most recent cohorts, up to 6.4 positions within the original graduation Cohort1 group. Further comparing between Cohort 4 and Cohort 5, meaning graduates entering the labour force in a similar period but differentiated by a computer science or information systems undergraduate major, there is only a minimal difference between these two groups with respect to the average number of appointments making up their careers to date.

**Table 5.14: Positional averages by cohort**

| Cohort: | Cohort 1 | Cohort 2 | Cohort 3 | Cohort 4 | Cohort 5 |
|---|---|---|---|---|---|
| | average | average | average | average | average |
| **Positions:** | 6.4 | 5.3 | 4.0 | 2.7 | 2.3 |

#### *5.7.2.5 Reasons for change by cohort*

From a cohort perspective the results for the reasons underlying positional movement in the career histories of graduates are quantified in Table 5.15. As explained in the previous level of these results, this aspect is of interest to determine the inter and intraorganisational employment mobility of graduates. These results show that apart for the those making up the Cohort 1, over time graduates most frequently changed due to external reasons. For Cohort 1, positional movement was more often attributed to 'other' causes. For all five graduation groups, the second most reported reason for change was because of internal career movements.

**Table 5.15: Reasons for change by cohort**

| Reason | Cohort 1 | Cohort 2 | Cohort 3 | Cohort 4 | Cohort 5 |
|---|---|---|---|---|---|
| | (n=87) | (n=212) | (n=249) | (n=121) | (n=48) |
| | % | % | % | % | % |
| Internal | 39.1 | 41.5 | 31.7 | 38.0 | 29.2 |
| External | 16.1 | 42.9 | 48.2 | 42.2 | 47.9 |
| Other | 44.8 | 15.6 | 20.1 | 19.8 | 22.9 |

### 5.7.3 Level 2: between cohort analysis summary

As stated earlier the aim of this level was to introduce the notion of time to take into account the different periods in time when graduates entered the labour market and also the varying extent of work histories reported. The introductory demographic has shown that the bulk of responses have come from the two most recent time cohorts. This is not surprising as it was more difficult to trace the current location of many earlier graduates, so reducing the potential sample population to represent the more longstanding career group. Further, due to the greater time away from university contact, the motivation to participate could have been much lower among those graduates that were located and invited to take part. For the reason explained at the beginning of this section, the analysis at this level purposefully omits data in relation to the focus of graduate careers.

#### *5.7.3.1 Work history mobility*

The summary of work history mobility encompasses the three major areas, business sector involvement, geographical movement and duration of appointments as well as pursuing reasons promoting career change. The results from a cohort level 2

perspective have shown that:

- when examined from a time perspective, differences in the extent of business sector involvement became evident. The primary source of graduate employment for Cohort 1, Cohort 2 and Cohort 4 has been the public sector while for Cohort 3 and Cohort 5 the private sector has proved the major employer;
- at a lower level of detail when size of organisation was also taken into account, the previous result remains unchanged and, in addition, it showed that the larger proportion positional appointments have been in large organisations;
- the time perspective revealed a number of differences in the results for the geographical distribution in the work histories of graduates. Across the four time divisions Tasmania remained the major site of employment ranging from the extent of one third of positions reported for Cohort 3 up to two thirds of appointments reported by Cohort 4 and Cohort 5;
- while the UK remained the most popular overseas work destination, this outcome was shown to be limited to Cohort 1 which represented the foundation graduation group in the Department of Computer Science;
- Cohort 3 emerged as the most widely travelled group, with graduates having worked in a total of twenty-nine destinations.;
- Cohort 5 was shown to have been the least travelled group in pursuit of their careers;
- Cohort 1, Cohort 2 and Cohort 4 graduates have indicated a similar number of work destinations ranging from nine to 13 locations;
- the average duration between cohorts regardless of career focus has incrementally increased from 2.3 appointments in Cohort 5 up to 6.4 for the more longstanding Cohort 1;
- with the exception of Cohort 1, positional change has been more commonly motivated by external career movement, implying change to a new employer organisation.

## 5.8 Level 3: analysis of results between cohort career stream

At the third level of the analysis, the use of graduation cohorts continues and, in addition, an added perspective is provided by the inclusion of the career stream results. As a consequence the results for organisational and geographical mobility are again reported but in this tier the influence of career path on the career movements of graduates is also under examination.

This section of the results begins with a consideration of the extent of graduate involvement in each career stream across the five graduation cohorts. Following this, for the IS career stream, two aspects of their careers are examined. The first looks at the actual career focus of these graduates. The alignment of graduate career histories with a specific IS career focus is based an assumption that while it is possible to more accurately identify these in the more longer standing work histories, for more recent graduates such results can only be regarded as indicative. Nonetheless, the perceived benefit of this analysis is that it provides a basis to identify emerging patterns over time when career streams between graduation cohort are compared at

the higher level.

The second perspective provides the results for the extent IS role involvement, but this time differentiated to compare the outcomes between the five graduation cohorts.

For the hybrid career stream, alignment with a specific career is not possible and so when this category is considered the focus will be on positional involvement from two perspectives. Firstly, the ratio of IS to non-IS appointments and secondly, the extent to which these graduates have been engaged in specific IS occupational and non-IS related roles. Here the objective is to gain some insight into the scope of the employment activities for this career group.

The final career results report the career areas of graduates who have pursued non-IS related careers.

### 5.8.1 Graduation cohorts differentiated by career stream

In this section the previous results are further differentiated to follow through on the extent of career stream involvement across the five graduation cohorts. The outcome is graphically presented in Figure 5.9.

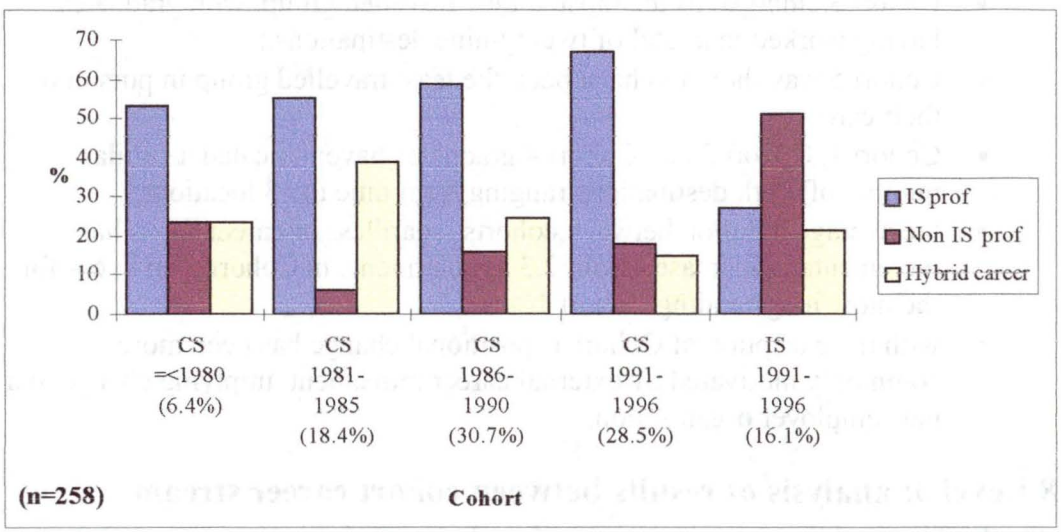


**Figure 5.9: Career stream by cohort**

This clearly shows that for the first four cohorts, which together constitute the computer science major graduates, the association between this undergraduate stream and a career as an IS professional is clearly evident. Over the different time frames, the orientation of these graduates towards an IS dedicated career has risen from 50% in Cohort 1 up almost 70% in the fourth and last computer science major cohort group. With one exception a hybrid career stream emerges as the second major career focus for three of these four cohorts. However, while for Cohort 2 this has been to the extent of 38.8% of the results in that group and for Cohort 3 it presents 24.4%, for Cohort 1 the remaining 50% not engaged in dedicated IS careers, has been equally divided between hybrid and non-IS career streams.

The results for the initial information systems graduation Cohort 5 suggest little relationship between this major and career involvement solely focussed in the IS

profession. Non-IS careers are dominant, being represented in just over half of the career stream distribution in this group. Of the remainder, 27% of these graduates are currently employed in the IS profession, while 22% have worked between these two streams and so fall into the hybrid career stream classification.

### 5.8.2 IS career stream

#### *5.8.2.1 IS Career focus*

Table 5.16 presents details of the fifteen areas of IS career focus identified across the five graduation cohorts. As explained in the earlier overview perspective of the results, these have been classified according to the IS literature where, for example, a systems development focussed career implies one where the career history is based on a progression of roles from programmer, analyst and/or analyst/programmer to culminate in a project management role (Tanniru 1983). While a software career path may also initially involve similar areas of work activity, the path deviates to a focus directed at systems engineering appointments.

When so classified the results show that systems development has been the main area of career activity for four of the five cohorts. However for Cohort 1 and Cohort 5 the same proportion of graduates have engaged in IS management careers. This area is also where the larger percentage of graduates making up the remaining Cohort 4 have followed a career. In this sense management refers to positions defined by respondents as IS appointments. This distinction is made because generally in the IS career literature (Chesebrough & Davis 1983) non-IS management positions constitute a hybrid career.

With only one exception careers dedicated to programming are the third and final area that is common to all computer science major based cohorts. The single anomaly relates to the original information systems major Cohort 5 and given the comparatively limited exposure to programming in this undergraduate curriculum, this result is not surprising. In the three most recent cohorts the emergence of careers in IS consulting is evident. For the computer science major groups, so also are careers in an academic environment, networking and software engineering. For the IS cohort involvement in what can only be a growth area, the internet also appears to be a new focus for careers in the IS profession.

**Table 5.16: IS career focus by cohort**

| Cohort | Ac | AP | Con | CSO | DB | GIS | Inet | Man | Mar | NW | Pg | SD | Sup | SW | Tech | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % | n= |
| 1 | | | | 12.5 | 12.5 | | | 25.0 | | | 12.5 | 25.0 | | 12.5 | | 8 |
| 2 | 3.7 | | | 3.7 | 7.4 | | | 18.5 | | 11.1 | 7.4 | 37.0 | | 7.4 | 3.7 | 27 |
| 3 | 2.0 | 4.0 | 12.0 | 8.0 | | | | 24.0 | | 6.0 | 6.0 | 30.0 | 4.0 | 2.0 | | 50 |
| 4 | 6.1 | 4.1 | 4.1 | 14.3 | 4.1 | 4.1 | | 18.4 | 2.0 | 4.1 | 12.2 | 14.3 | 8.2 | | 4.1 | 49 |
| 5 | | | 10.0 | 10.0 | | | 10.0 | 30.0 | | 10.0 | | 30.0 | | | | 10 |

**Legend:**

| | | | |
|---|---|---|---|
| **Ac** | Academic | **Mar** | Marketing |
| **AP** | Analyst/programmer | **NW** | Network |
| **Con** | Consultant | **Pg** | Programming |
| **CSO** | Computer systems officer | **SD** | Systems development |
| **DB** | Database | **Sup** | Support |
| **GIS** | Graphical information systems | **SW** | Software |
| **Inet** | Internet | **Tech** | Technical |
| **Man** | Management | | |

*IS job involvement*

Table 5.17 distinguishes the distribution of IS appointments of graduates classified into the IS career stream from those also presented at the overview perspective level when the results were combined to quantify all IS appointments regardless of career stream. From a dedicated IS career stream perspective the results show that just over half (55.0%) are divided between three roles, those of programmer, analyst/programmer and manager. To a lesser extent, six roles were also reported, that of administrator, consultant, DBA, engineer, officer and support while those minimally represented were academic, analyst, coordinator, director, leader, specialist, graduate trainee appointments in addition to an 'other' category.

**Table 5.17: Dedicated IS career stream positional involvement**

| Title | |
|---|---|
| | (n=556) |
| | % |
| programmer | 23.9 |
| analyst/programmer | 18.7 |
| manager | 12.4 |
| consultant | 7.2 |
| CSO | 7.0 |
| engineer | 5.2 |
| support | 4.9 |
| administrator | 4.5 |
| DBA | 3.4 |
| leader | 2.4 |
| academic | 1.8 |
| coordinator | 1.6 |
| analyst | 1.4 |
| graduate trainee | 1.3 |
| specialist | 1.3 |
| licence management service | 1.3 |
| architect | 1.3 |
| director | 1.1 |
| webmaster | 0.5 |
| scientist | 0.5 |
| communicator | 0.5 |
| supervisor | 0.5 |

*IS role involvement by graduation cohort*

Table 5.18 further reports these results which have been differentiated according to the graduation cohort. Clearly, for the first four cohorts, the major activity in their careers to date has been employment in a programmer capacity, to the extent of nearly one quarter of all positions reported within these graduation cohorts. In addition, two other IS appointments, analyst/programmer and manager have also been dominant areas of employment for the computer science major graduates making up this sample.

Based on this division of the data, in the results for Cohort 1 twelve IS roles emerge. Possibly reflecting the more long standing work histories in this group, the second most often held positions have been in management. In decreasing order, other roles filled by these graduates have been analyst/programmer, CSO, DBA and engineer. Director and consultant positions have been equally reported (3.9%) as also, though

to a lesser extent, have analyst, LAN administrator, academic and specialist appointments.

For Cohort 2, of the 16 position titles contained in this subset of the data, there is only a marginal difference between the distribution of analyst/programmer (17.9%) and management appointments (17.2%) as the second most frequently recorded positions. Again, in decreasing order, graduates making up this cohort have also been involved as engineers and analysts. In addition, equal numbers have worked as academics, consultants or CSOs. Then follows a focus on specialist or support appointments. Graduates making up this cohort have also had marginal associations working in technical architect, coordinator, graduate trainee or communicator areas.

The results for Cohort 3 contains a total of 18 positional roles. Within this group there is little difference between their involvement as programmers or working in the combined analyst/programmer role. The next most commonly reported position is that of a consultant, followed by managerial appointments. Apart from the only minimal role involvement these graduates have also held analyst, engineering and support roles.

For Cohort 4, sixteen categories were identified and of these again the dominant focus of these graduates has been in programmer appointments. However in this graduation group IS support emerged as the second most frequently reported IS position. It follows that due to the ever increasing uptake of computing and its more widespread penetration in all areas of organisations this role must represent one of the newer growth areas for employment in the IS profession. In addition, but to a lesser extent, the career involvement of these graduates has been equally divided between manager or CSO appointments as also have analyst/programmer or consultant positions. The remainder of activity is widely spread with a single example of being employed as a technical document writer.

Cohort 5 is the exception in these results. Within this graduation group only ten areas of employment were reported with the most common focussing on three positions: analyst, analyst /programmer and graduate traineeships. These graduates have also worked as consultants and also have minimal associations in filling LAN administration, programmer and webmaster roles.

**Table 5.18: IS career stream positional involvement by cohort**

| Title | Cohort 1 | Cohort 2 | Cohort 3 | Cohort 4 | Cohort 5 |
|---|---|---|---|---|---|
| | (n=52) | (n=145) | (n=212) | (n=126) | (n=21) |
| | % | % | % | % | % |
| programmer | 25.0 | 22.1 | 26.4 | 24.6 | 4.8 |
| manager | 19.2 | 17.2 | 8.5 | 10.3 | 14.3 |
| analyst/programmer | 15.4 | 17.9 | 26.0 | 9.5 | 14.3 |
| CSO | 11.5 | 3.5 | 5.7 | 10.3 | 14.3 |
| DBA | 7.7 | 4.1 | 2.4 | 3.2 | |
| engineer | 5.8 | 8.3 | 4.7 | 3.2 | |
| director | 3.9 | | .5 | 2.4 | |
| consultant | 3.9 | 3.5 | 9.0 | 9.5 | 9.5 |
| specialist | 1.9 | 2.8 | 0.9 | 2.4 | |
| analyst | 1.9 | 6.9 | 5.2 | | 14.3 |
| administrator | 1.9 | | 0.9 | 3.2 | 4.8 |
| academic | 1.9 | 3.5 | .5 | 2.4 | |
| supervisor | 1.9 | | | | |
| webmaster | | | | | 4.8 |
| tech document writer | | | | 0.8 | |
| support | | 2.1 | 4.3 | 11.1 | 4.8 |
| scientist | | | 0.5 | 0.8 | |
| license management | | | 0.5 | | |
| leader | | 4.1 | 1.9 | 2.4 | |
| graduate trainee | | 0.7 | 1.4 | | 14.3 |
| coordinator | | 1.4 | 0.9 | 4.0 | |
| communicator | | 0.7 | | | |
| architect | | 1.4 | | | |

### *5.8.2.2 IS stream work history mobility*

At level three of the presentation of the results for the first research question, the second issue examines work history mobility with a specific focus on the IS career stream viewed over time between the five graduation cohorts. In this portion of the results again all five aspects of work history mobility are considered.

*Distribution of graduate employment: IS career stream business sector by cohort*

Overall, between business sectors the extent of involvement for the IS career stream has been marginally greater in the public sector (46.0%) compared with 45.9% in the private sector. The remaining less than 10% has been in GBEs (7.0%) and an other category accounted for 1.1% of their career involvement.

When viewed from a cohort perspective, Table 5.19 indicates that a majority of employment for this career group is divided between the public and the private sectors. While the public sector has been the dominant source of positional opportunities for Cohort 1, Cohort 2 and Cohort 4, for the remaining two cohorts their careers have largely been focussed in the private sector. The role of GBEs as an employer is also highlighted where, for the initial IS major graduation group, this has been the source of 14.3% of their employment.

**Table 5.19: IS career stream business sector by cohort**

| Sector | Cohort 1 | Cohort 2 | Cohort 3 | Cohort 4 | Cohort 5 |
|---|---|---|---|---|---|
| | (n=52) | (n=145) | (n=212) | (n=126) | (n=21) |
| | % | % | % | % | % |
| **Public** | 57.7 | 55.2 | 36.3 | 49.2 | 33.3 |
| **GBE** | 3.8 | 9.0 | 7.5 | 4.0 | 14.3 |
| **Private** | 38.4 | 35.9 | 54.2 | 46.0 | 47.6 |
| **Other** | | | 1.9 | 0.8 | 4.8 |

*Distribution of graduate employment: IS career stream size of organisation by cohort*

Reducing these results to organisational size (refer to Table 5.20) confirms the role of large organisations as an employer of graduates engaging in careers as IS professionals. Apart from Cohort 3 and Cohort 5, once again the major focus of positions have been in public organisations. Yet again the role of small business in the private sector is evident in relation to the most recent group of computer science majors (Cohort 4).

**Table 5.20: IS career stream business sector & organisational size by cohort**

| Organisation | Cohort 1 | Cohort 2 | Cohort 3 | Cohort 4 | Cohort 5 |
|---|---|---|---|---|---|
| size/sector | (n=52) | (n=145) | (n=212) | (n=126) | (n=21) |
| | % | % | % | % | % |
| **Public** | | | | | |
| Large | 51.9 | 40.7 | 31.6 | 38.9 | 23.8 |
| Medium | 5.8 | 12.4 | 4.2 | 8.7 | 9.5 |
| Small | | 2.1 | 0.5 | 1.6 | |
| **GBE** | | | | | |
| Large | 3.8 | 6.9 | 7.5 | 3.2 | 14.3 |
| Medium | | 1.4 | | 0.8 | |
| Small | | 0.7 | | | |
| **Private** | | | | | |
| Large | 34.6 | 29.0 | 34.4 | 12.7 | 33.3 |
| Medium | | 2.8 | 10.4 | 13.5 | 9.5 |
| Small | 3.8 | 4.1 | 9.4 | 19.8 | 4.8 |
| **Other** | | | 1.9 | 0.8 | 4.8 |

*Distribution of graduate employment: IS career stream geographical location by cohort*

Overall 41.4% of the total of 556 positions reported by graduates in the IS career stream have been located in Tasmania. The next most popular employment destinations have been the ACT, Victoria and New South Wales, where each consecutively account for 14.7%, 14.2% and 14% of the results in this section. For this total group the UK (5.9%) has been the leading overseas destination for this career group of graduates.

As shown in Table 5.21, when the results for geographical locations are compared between graduation cohorts in this graduate career stream group, the range of destinations varies. Cohort 3 emerges as having been the most widely travelled group in the course of their employment, working in a total of 14 destinations. In decreasing order of geographic distribution of careers follow Cohort 2, Cohort 4, Cohort 1 and Cohort 5.

Tasmania has been central to the employment reported in this career group. While percentage wise between Cohort1 to Cohort 3 this has decreased from 44% to 30%, for the two most recent graduation groups, this state has provided between 62% (Cohort 4) and 57% (Cohort 5) of their employment.

Within Cohort 1 and Cohort 2 the second major source of employment has been located in the ACT. However, after this the geographical distribution of employment between these two cohorts diverge. The remaining focus of work for Cohort 1 graduates has been in the UK with limited representation in New South Wales or Victoria and only minimal appointments reported Australia wide or in Singapore. For Cohort 2 Victoria has been the 3rd most significant employment destination with these graduates also finding work in New South Wales, Queensland and South Australia. Outside this country they have held employment in the UK, USA and Canada.

For the remaining and more recent cohorts, the ACT has proved a decreasingly popular work destination. Eight percent of work reported within Cohort 3 was in the ACT as was 7.9% for Cohort 4. As yet no graduates from the initial information systems graduation cohort has worked in that location. Across these 3 cohorts careers have been focussed in Victoria and New South Wales. For Cohort 5 graduates, this last state has provided employment to the extent of one third of the overall positions recorded by this group.

**Table 5.21: IS career stream geographical mobility by cohort**

| Location | Cohort 1 | Cohort 2 | Cohort 3 | Cohort 4 | Cohort 5 |
|---|---|---|---|---|---|
| | (n=52) | (n=145) | (n=212) | (n=126) | (n=21) |
| | % | % | % | % | % |
| Tasmania | 44.2 | 35.9 | 30.7 | 61.9 | 57.1 |
| ACT | 28.8 | 27.6 | 8.0 | 7.9 | |
| Victoria | 1.9 | 15.9 | 20.8 | 7.1 | 9.5 |
| New South Wales | 5.8 | 3.4 | 21.2 | 14.3 | 33.3 |
| UK | 15.4 | 3.4 | 5.2 | 4.8 | |
| Queensland | | 3.4 | 5.2 | | |
| USA | | 4.8 | | 2.4 | |
| South Australia | | 0.7 | 3.3 | 0.8 | |
| Aust wide | 1.9 | | 2.4 | | |
| NZ | | 2.8 | 0.9 | | |
| Singapore | 1.9 | | 0.5 | | |
| Canada | | 1.4 | | | |
| WA | | | 0.5 | | |
| NZ/Aust/Pacific | | 0.7 | | | |
| Malaysia | | | 0.5 | | |
| Philippines | | | 0.5 | | |
| Indonesia | | | 0.5 | | |
| Germany | | | | 0.8 | |

In the previous perspective of the results, the two aspects of career mobility, positional mobility and reasons for change were examined according to graduation cohorts. In this section these results are redefined to reflect the outcomes for the three career streams. The results for the IS career stream initiates the first of these results.

*Positional mobility: IS career stream by cohort*

A further aspect of results for graduates making up the IS career stream reports the average number of appointments within each of the five time frames differentiating this data. As Table 5.22 shows, these results range, on average, from 2.2 for Cohort 5 graduates and then incrementally increase between Cohort 4, Cohort 3, Cohort 2 to the highest average of 6.5 positions for the most longstanding Cohort 1. For Cohort 4 and Cohort 5, which reflect similar periods in the labour force, there is only a minimal difference separating the positional mobility between computer science or information systems major graduates.

**Table 5.22: IS career stream positional mobility by cohort**

| Cohort 1 | Cohort 2 | Cohort 3 | Cohort 4 | Cohort 5 |
|---|---|---|---|---|
| av/ range | av/range | av/range | av/range | av/range |
| 6.5 (1-15) | 5.37 (1-9) | 4.24 (1-12) | 2.57 (1-6) | 2.2 (1-3) |

*Reasons for change: IS career stream by cohort*

The final area of results for this IS career stream considers one of three reasons prompting positional change. Table 5.23 shows the results when one of three reasons graduates reported for leaving an appointment are quantified. To recap this aspect of the results implies the extent to which the positional movements reported in the career histories of this graduate group have been based on interorganisational or intraorganisational change. Clearly for Cohort 1 and Cohort 5 the greater percentage of their career mobility was due to taking up a new appointment while remaining

with an existing employer. Conversely, for the three remaining cohorts, more often the reason for leaving a position was motivated by a move to a different organisation.

**Table 5.23: IS career stream reasons for positional changes by cohort**

| Reason | Cohort 1 | Cohort 2 | Cohort 3 | Cohort 4 | Cohort 5 |
|---|---|---|---|---|---|
| | (n=44) | (n=118) | (n=161) | (n=77) | (n=11) |
| | % | % | % | % | % |
| internal | 56.8 | 40.7 | 30.4 | 37.7 | 54.5 |
| external | 18.2 | 49.1 | 55.2 | 41.6 | 27.3 |
| other | 25.0 | 10.2 | 14.3 | 20.4 | 18.2 |

### 5.8.3 Hybrid career stream

#### *5.8.3.1 Career*

As established at the beginning of this section, the results the hybrid career stream are based on the work histories reporting involvement in both IS and non-IS related appointments. In addition, it was explained that due to the diversity of positional roles reported in this section of the data, it is impossible to define discrete career focus categories. Consequently, in relation to the hybrid career stream the results are limited to reporting the proportion of IS and non-IS roles to determine the extent of IS career orientation. These are then further examined to describe the range of appointments that each stream of employment involves.

*Ratio of IS to non-IS appointments*

The aim of this section is to consider the extent to which graduates have engaged in IS and non-IS appointments. It is based on the assumption that if one emerges as dominant then it could represent either a considerable move away from IS appointments or, conversely, an increased orientation to employment in the industry.

The results that follow describe a total of 288 career appointments which reflects an adjustment necessary because of missing data in some aspects of these results. When the positional focus for each appointment is quantified, it shows only a marginal difference between IS and non-IS positions as defined by the respondents. Overall, 146 IS appointments were reported compared to 142 non-IS related roles.

When this data are further divided into graduation cohorts, then broadly the orientation towards a dominant focus in IS positional appointments is only true for two of the five graduation cohorts. Table 5.24 presents these results and shows while this is the case for Cohort 2 and Cohort 4, for Cohort 1, Cohort 3 and Cohort 5 the greater proportion of their positions have been in other than IS related areas. Therefore, from a cohort perspective, for those based on computer science majors, the results are equally divided, while for the initial information systems graduation Cohort 5, to the time the graduate career survey was administered, their employment has mostly been in alternative areas.

**Table 5.24: Proportion of hybrid career stream IS & non-IS positions by cohort**

| Cohort / role focus | Cohort 1 | Cohort 2 | Cohort 3 | Cohort 4 | Cohort 5 |
|---|---|---|---|---|---|
| | (n = 33) | (n = 99) | (n = 94) | (n = 42) | (n = 20) |
| | % | % | % | % | % |
| IS | 45.5 | 56.5 | 48.9 | 52.4 | 35.0 |
| Non-IS | 54.5 | 43.5 | 51.1 | 47.6 | 65.0 |

*Hybrid career stream IS positional involvement*

In the preceding level of analysis the overall range and distribution of IS appointments were reported. Earlier in this level these results were differentiated to extract and report the extent of IS appointments within the IS career stream. In this portion of the results the remainder that describe the IS positional appointments within the hybrid career stream are presented. As Table 5.25 shows, this is based on a total of 17 IS positional roles. Again, as with the IS career stream, a few specific roles emerge which dominate the extent of graduate IS positional involvement. Of these, over half (54%) have been focussed in programmer (25.3%), management (18%) and analyst/programmer (10.7%) positions. A further 32% have been directed at CSO, engineer, support, analyst and leader appointments. In addition to an 'other' category, the remaining 14% describes minimal involvement in a further 8 IS positional titles.

**Table 5.25: Hybrid career stream IS positions**

| Title | |
|---|---|
| | (n=146) |
| | % |
| programmer | 25.3 |
| manager | 18.0 |
| analyst/programmer | 10.7 |
| engineer | 8.0 |
| CSO | 7.3 |
| leader | 6.7 |
| analyst | 6.0 |
| support | 4.7 |
| consultant | 4.0 |
| administrator | 2.0 |
| coordinator | 2.0 |
| auditor | 1.3 |
| director | 1.3 |
| systems strategist | 1.3 |
| technical document writer | 0.7 |
| academic | 0.7 |

When these results are further distributed into graduation cohorts, the range of IS appointments varies from a total of 4 for Cohort 1, up to 13 specific areas of IS employment reported by graduates making up Cohort 3. These results are presented in Table 5.26. It shows that over time, programming appointments have declined as a source of IS involvement for this hybrid career stream. This statement is only directed at the 4 computer science major cohorts, as the limited association between this role, and the initial information systems Cohort 5 has already been established earlier in these results. While programmer appointments accounted for two thirds of the IS positions reported by graduates in Cohort 1, it represented less than one third

of the IS employment activities for Cohort 2 and it was no longer the dominant IS career focus in the remaining two cohorts.

For Cohort 3, IS management roles emerged as the main area of employment in the profession. This result is also true for Cohort 4, however, in this group there has been a similar extent of involvement in leadership positions. While management appointments were the second main source of IS career activity for Cohort 2, interestingly there was not a single example of this role in the Cohort 1 data. For this group the next main source of employment has been that of working as analyst/programmer.

The results for Cohort 5 reveal that of the six positional roles reported within this group, with only one exception these have been equally represented. For this group analyst appointments have been double those of the other positions.

**Table 5.26: Hybrid career stream IS positions by cohort**

| Title | Cohort 1 | Cohort 2 | Cohort 3 | Cohort 4 | Cohort 5 |
|---|---|---|---|---|---|
| | (n=15) | (n=56) | (n=46) | (n=22) | (n=7) |
| | % | % | % | % | % |
| academic | | | | 4.6 | |
| administrator | | | | 4.6 | 14.3 |
| analyst | 6.7 | 3.6 | 4.4 | 4.6 | 28.8 |
| analyst/programmer | 20.0 | 10.7 | 10.9 | 4.6 | 14.3 |
| auditor | | | 4.4 | | |
| coordinator | | 1.8 | | 4.6 | |
| consultant | | 1.8 | 2.2 | 4.6 | 14.3 |
| CSO | | 5.4 | 10.9 | 4.6 | 14.3 |
| director | | 1.8 | 2.2 | | |
| engineer | 6.7 | 7.1 | 13.0 | 4.6 | |
| leader | | 7.1 | 2.2 | 22.7 | |
| manager | | 21.4 | 21.7 | 22.7 | |
| systems strategist | | 5.4 | | | |
| technical doc writer | | | 6.5 | | |
| programmer | 66.7 | 30.4 | 15.2 | 18.2 | |
| support | | 3.6 | 6.5 | | 14.3 |

*Hybrid career stream non-IS positional involvement*

This section of the results considers the non-IS positional involvement within the career histories for the hybrid career group. Again, in this subsection the results will be viewed from two perspectives. Firstly, from an overview level and secondly, when divided according to each of the five graduation cohorts (Tables 5.27 & 5.28).

Basically, the extent of graduate involvement in non-IS positions can be defined into 12 positional roles, plus one additional 'other' category. These results which highlight the diversity of roles graduates have filled with over one third being classified in the 'other' category. Of these more than half (52%) relate to non professional appointments, meaning positions where it is unlikely that tertiary qualifications would have been a prerequisite. The specific areas involved will be further elaborated in the next sub section of these results. When the three educational roles, those of lecturer, teacher or tutor are combined, then these account for a further one quarter of the distribution of graduate employment.

Proportionally, officer appointments are also significant. In relation to this career stream, this category is based on officer roles defined by respondents as not an IS position. These include officer positions both when broadly defined and also when more descriptively quantified. For example, specific areas of officer focus are education, research, defence, policy, quality assurance and science. Similarly, the overall 7.8% representation of management positions also includes acting in a range of capacities such as account, audit, customer service, finance, quality assurance and R&D. Of the remaining 21.3%, graduates have also reported career involvement as directors, surveyors (4.2% each), accountants (3.5%) consultants (2.8%), assessors, engineers and graduate research assistants (2.1%).

**Table 5.27: Hybrid career stream non-IS positions**

| Title | |
|---|---|
| | (n=142) |
| | % |
| accountant | 3.5 |
| assessor | 2.1 |
| consultant | 2.8 |
| director | 4.2 |
| engineer | 2.1 |
| graduate research assistant | 2.1 |
| lecturer | 5.6 |
| manager | 7.8 |
| officer | 11.3 |
| other | 35.2 |
| surveyor | 4.2 |
| teacher | 15.5 |
| tutor | 3.5 |

The second aspect of these results further divides the previous data to show the outcome when viewed according to graduation cohorts. These results are shown in Table 5.28. Again, this highlights the high diversity of employment experiences of graduates. Across the five cohorts the 'other' category accounted for between 25% up to 47% of the positional roles reported. When this aspect of the results is examined further, then within these cohorts, from one third up to 63% of the appointments can be defined as non professional. As such it is assumed that many of these appointments may represent 'stop gap' employment in the career histories of these graduates. For example, graduates in Cohort 3 have been engaged as clerks, a builder's labourer, dairy hand, fruit picker, mechanic, operator and waiter. Higher status employment in the 'other' category for this group includes analyst, facilitator, finance controller, masseur, technical editor and translator/proof reader appointments.

Apart from the 'other' category, Cohort 2 graduates held the highest distribution of non-IS appointments, recording employment in ten of the twelve positional roles established within this section of the results. In decreasing order follow Cohort 3 (9), Cohort 4 (7), Cohort 1 (6) and Cohort 5 (4).

Following through on the earlier results relating the extent of involvement of graduates in education, from this perspective this shows that across all five cohorts graduates have worked as teachers. However, this is not the case when lecturer and tutor positions are considered. Graduates from three cohorts (1, 3 and 4) have worked

at some stage in their careers as lecturers, similarly those in Cohort 2 and Cohort 4 have acted as tutors.

Across all four computer science major graduation cohorts, graduates have reported periodic employment as surveyors. The three earliest graduation cohorts have also reported involvement as managers and officers. Reflecting the more longstanding careers for Cohort 1 and Cohort 2, many graduates have held directorship roles. Finally, the four most recent cohort have also reported spending a portion of their careers working as accountants.

**Table 5.28: Hybrid career stream non-IS positions by cohort**

| Title | Cohort 1 | Cohort 2 | Cohort 3 | Cohort 4 | Cohort 5 |
|---|---|---|---|---|---|
| | (n=18) | (n=43) | (n=48) | (n=20) | (n=13) |
| | % | % | % | % | % |
| accountant | | 4.7 | 2.1 | 5.0 | 7.7 |
| assessor | | 2.3 | | 10.0 | |
| consultant | | 2.3 | 2.1 | 10.0 | |
| director | 11.1 | 9.3 | | | |
| engineer | | | 6.3 | | |
| graduate research assistant | | 4.7 | 2.1 | | |
| lecturer | 11.1 | | 6.3 | 15.0 | |
| manager | 16.7 | 4.7 | 8.3 | | 15.4 |
| officer | 5.6 | 14.0 | 10.4 | | 30.8 |
| other | 27.8 | 25.6 | 47.9 | 30.0 | 38.5 |
| surveyor | 5.6 | 2.3 | 4.2 | 10.0 | |
| teacher | 22.2 | 23.3 | 10.4 | 10.0 | 7.7 |
| tutor | | 7.0 | | 10.0 | |

### *5.8.3.2 Hybrid stream work history mobility*

Within the hybrid career stream the results for the distribution of employment between business sector shows that 43.2% has been in the public sector, 9.3% in GBEs, 47.3% in the private sector and 0.3% attributed to multiple focuses career appointments.

*Distribution of graduate employment: hybrid career stream by cohort*

When the results are taken from a business sector perspective, as shown in Table 5.29, it is apparent that the private sector emerges as the most significant provider of employment within this career group. With only one exception, this business sector has provided between 41.7% up to 67.7% of the IS positions held by graduates in Cohort 1, Cohort 3, Cohort 4 and Cohort 5. However, for this last graduation cohort they have also worked to the same extent in the public business sector. In addition, for graduates classified as Cohort 2, the public sector has proven to be the main source of employment.

**Table 5.29: Hybrid career stream business sector by cohort**

| Sector | Cohort 1 | Cohort 2 | Cohort 3 | Cohort 4 | Cohort 5 |
|---|---|---|---|---|---|
| | (n=33) | (n=99) | (n=94) | (n=42) | (n=20) |
| | % | % | % | % | % |
| **Public** | 32.3 | 64.4 | 24.2 | 42.9 | 41.7 |
| **GBE** | | 3.0 | 13.2 | | 16.7 |
| **Private** | 67.7 | 32.7 | 62.6 | 54.8 | 41.7 |
| **Other** | | | | 2.4 | |

*Distribution of graduate employment size of organisation: hybrid career stream by cohort*

In Table 5.30, the above results are presented in a greater detail to show the distribution of employment between the different sizes of organisation within each business sector. This reveals that the major focus for the original computer science cohort has been largely divided between large and small sized private businesses. For the second graduation cohort, the focus in the public sector has been within large organisations. With Cohort 3 however, small private businesses have been the source of 31.9% of employment reported by this group. While for Cohort 4 the previous table showed the majority of employment to be in the private sector, when the data are divided into size of organisation, large public organisations emerged as the most significant employer. In the private sector, again the contribution of small business to employment is evident. It is here that 28.6% of employment within this cohort has been directed.

**Table 5.30: Hybrid career stream business sector & organisational size by cohort**

| Sector/ Organisation | Cohort 1 | Cohort 2 | Cohort 3 | Cohort 4 | Cohort 5 |
|---|---|---|---|---|---|
| | (n=33) | (n=99) | (n=94) | (n=42) | (n=20) |
| | % | % | % | % | % |
| **Public** | | | | | |
| Large | 23.5 | 53.5 | 14.3 | 38.1 | 41.7 |
| Medium | 2.9 | 9.9 | 8.8 | 4.8 | |
| Small | 5.9 | 1.0 | 1.1 | | |
| **GBE** | | | | | |
| Large | | 2.0 | 13.2 | | 8.3 |
| Medium | | 1.0 | | | 8.3 |
| Small | | | | | |
| **Private** | | | | | |
| Large | 26.5 | 14.9 | 19.8 | 16.7 | 33.3 |
| Medium | 29.4 | 6.9 | 11.0 | 9.5 | 4.2 |
| Small | 11.8 | 10.9 | 31.9 | 28.6 | 4.2 |
| **Other** | | | | 2.4 | |

*Distribution of graduate employment geographical location: hybrid career stream by cohort*

The geographic results (Table 5.31) recorded by graduates making up the hybrid career stream, are based on a revised sample size of 292 positions. From this total number of appointments the main destinations have been Tasmania (60.3%), the UK and Victoria (8.9%) New South Wales (6.2%) and the ACT (3.4%).

A comparison of the diversity of destinations between the cohorts making up this portion of the results shows Cohort 3 to be the most geographically mobile group, reporting appointments in a total of 23 locations. This is considerably ahead of the

other cohorts. For the second and fourth cohort groups, a total of seven destinations were reported, while the career histories for the earliest group of graduates (Cohort 1) have been distributed between five locations. The initial information systems cohort (Cohort 5) is the least mobile, with their employment to date limited to a total of 4 geographic areas.

With one exception, again Tasmania has been the major focus of employment for these graduates who have pursued a hybrid career stream. For Cohort 1, exactly half of the positions reported by this group have been in the UK compared to 35.3% located in Tasmania. For Cohort 2, Cohort 4 and Cohort 5 employment in Tasmania has accounted for 71.3%, 69% and 79.2% respectively, while for Cohort 3 this figure is 48.4%.

While all graduates from each cohort have worked in the UK, this commonality is not true when the distribution of results for Victoria, New South Wales and the ACT are considered. The career histories of those in Cohort 1 did not report any appointments in Victoria, as was the case for Cohort 4 in relation to New South Wales as a work destination. The exceptions in relation to the ACT are Cohort 1 and Cohort 5.

**Table 5.31: Hybrid career stream geographical mobility by cohort**

| Location | Cohort 1 | Cohort 2 | Cohort 3 | Cohort 4 | Cohort 5 |
|---|---|---|---|---|---|
| | (n=33) | (n=97)* | (n=94) | (n=42) | (n=20) |
| | % | % | % | % | % |
| Tasmania | 35.3 | 71.3 | 48.4 | 69.0 | 79.2 |
| UK | 50.0 | 4.0 | 2.2 | 4.8 | 4.2 |
| Victoria | | 8.9 | 7.7 | 14.3 | 12.5 |
| New South Wales | 8.8 | 5.9 | 8.8 | | 4.2 |
| ACT | | 7.9 | 1.1 | 2.4 | |
| Queensland | 2.9 | | 3.3 | 2.4 | |
| Japan | | | 5.5 | | |
| South Australia | | | 2.2 | 4.8 | |
| USA | 2.9 | | 2.2 | | |
| Switzerland | | | 3.3 | | |
| NT | | | 1.1 | 2.4 | |
| Hong Kong | | | 2.2 | | |
| WA | | 1.0 | | | |
| Canada | | | 1.1 | | |
| Asia | | 1.0 | | | |
| Indonesia | | | 1.1 | | |
| Antarctica | | | 1.1 | | |
| NT/PNG | | | 1.1 | | |
| Aust wide | | | 1.1 | | |
| Tas/Ant | | | 1.1 | | |
| Germany | | | 1.1 | | |
| Belgium | | | 1.1 | | |
| Fiji | | | 1.1 | | |
| Thailand | | | 1.1 | | |
| France | | | 1.1 | | |

* adjusted to reflect 2 cases of missing data

*Positional mobility: hybrid career stream by cohort*

This section of the results reports the positional mobility for graduates making up the hybrid career stream. As with the previous IS career group, when this data are divided by graduation cohorts, then the average number of positions reported again incrementally increases over time with only a marginal difference between the results for the two most recent cohorts. Table 4.32 shows that, on average, this ranges from 3 positions within Cohort 5 up to 8.5 for Cohort 1.

**Table 5.32: Hybrid career stream positional mobility by cohort**

| Cohort 1 | Cohort 2 | Cohort 3 | Cohort 4 | Cohort 5 |
|---|---|---|---|---|
| av/ range | av/range | av/range | av/range | av/range |
| 8.5 (4-17) | 5.3 (3-13) | 4.7 (2-15) | 3.9 (1-6) | 3.0 (1-4) |

*Reasons for change: hybrid career stream by cohort*

For this second career stream group, graduates reported changing positions for mostly either internal or 'other' reasons. As indicated in Table 5.33 the larger proportion of positional movement for Cohort 2 and Cohort 5 was based on internal change, whereas for Cohort 1 and, to a lesser extent, for Cohort 3 'other' reasons were most frequently reported. Cohort 4 is the only group in this career stream where the majority of change was based on external career mobility.

**Table 5.33: Percentage hybrid career stream reasons for positional changes by cohort**

| | Cohort 1 | Cohort 2 | Cohort 3 | Cohort 4 | Cohort 5 |
|---|---|---|---|---|---|
| | (n=30) | (n=82) | (n=71) | (n=30) | (n=16) |
| | % | % | % | % | % |
| internal | 10.0 | 40.2 | 29.7 | 35.5 | 43.7 |
| external | 13.0 | 35.4 | 33.7 | 38.7 | 31.3 |
| other | 76.7 | 24.3 | 36.5 | 25.8 | 25.0 |

### 5.8.4 Non-IS career stream

#### *5.8.4.1 Career*

The final aspect considered in this perspective of the results conveys the mobility outcomes based on the career histories of graduates reporting an alternative non-IS career stream.

*Non-IS stream career focus*

In the previous overview level the 52 career histories making up this portion of the results were classified into 11 areas of career focus plus an 'other' category. These results are now expanded to show the extent of involvement within each identified area of career focus according to graduation cohorts.

Table 5.34 presents these results and clearly shows that over time the dominant non-IS related career focus has related to employment in academic/teaching capacity. Of the five graduation cohorts this represents the only common area of non-IS career involvement. For the computer science major graduates the extent of association with this career ranges from just over 30% for Cohort 3 up to 100% for Cohort 1 while for Cohort 5 this accounted for 10.6%.

Finance or accounting are the only remaining careers shared by both computer science and information systems major graduates.

Over time, the influence on graduates of the widening scope of degree awards becomes evident. For the three most recent graduation cohorts, while many have completed a major in computer science or information systems, their careers have focussed on their primary tertiary qualifications. For example, the 19 graduates forming the initial information systems graduation represent bachelor degrees in Engineering, Arts and Commerce and this is reflected in the significant involvement of these graduates in accounting, finance and marketing careers.

**Table 5.34: Non-IS career stream focus by cohort**

| Cohort | Ac | Account | Off | Eng | Fin | Ins | Law | Manu | Mar | Psych | Welfare | Other | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | % | % | % | % | % | % | % | % | % | % | % | % | n= |
| 1 | 100.0 | | | | | | | | | | | | 4 |
| 2 | 66.6 | | | | | | | 33.3 | | | | | 3 |
| 3 | 30.8 | 7.7 | | 15.4 | 23.1 | 7.7 | 7.7 | | | | | 7.7 | 13 |
| 4 | 53.9 | | | 23.1 | 7.7 | | | | | 7.7 | | 7.7 | 13 |
| 5 | 10.6 | 31.6 | 10.6 | | 5.3 | | | | 10.6 | | 5.3 | 26.3 | 19 |

Legend:

| | | | |
|---|---|---|---|
| **Ac** | Academic | **Law** | Law |
| **Account** | Accounting | **Manu** | Manufacturing |
| **Off** | Officer | **Mar** | Marketing |
| **Eng** | Engineering | **Psych** | Psychology |
| **Fin** | Finance | **Welfare** | Welfare |
| **Ins** | Insurance | **Other** | Non identifiable career focus |

### *5.8.4.2 Non-IS career stream work history mobility*

For this third career stream group, organisational involvement is reviewed from two additional perspectives. Firstly, when broadly divided according to business sector and then secondly the extent of involvement when the size of organisation is taken into account.

*Distribution of graduate employment business sector: non-IS career stream by cohort*

Within this career stream the career activities of these graduates has been divided between business sector to an extent of 44.5% in the public sector, 7.0% in GBEs and 48.4% in private business.

Table 5.35 provides this view of the results and shows that for three of the five graduations cohorts, the major focus of employment has been in private organisations. For Cohort 1 and Cohort 4, the public sector has been the dominant source of positions. It is apparent there are clear associations between the business sector and the careers reported. For example, the link between the complete academic/education focus of the careers in Cohort 1, and the 94% participation in the public sector. In addition, for the information systems cohort, where one graduate holds a bachelor of economics and ten were awarded bachelor of commerce degrees, there also appears to be some relationship between their orientation to careers in finance and involvement in the private business sector.

**Table 5.35: Percentage of non-IS career stream business sector by cohort**

| Sector | Cohort 1 | Cohort 2 | Cohort 3 | Cohort 4 | Cohort 5 |
|---|---|---|---|---|---|
| | (n=17) | (n=14) | (n=30) | (n=27) | (n=40) |
| | % | % | % | % | % |
| **Public** | 94.1 | 42.9 | 36.7 | 55.6 | 22.5 |
| **GBE** | 0.0 | 0.0 | 13.3 | 14.8 | 2.5 |
| **Private** | 5.9 | 57.1 | 50.0 | 29.6 | 75.0 |

*Distribution of graduate employment size of organisation non-IS career stream by cohort*

When these results are expanded to show size of organisation within business sectors some further points of interest in these results emerge. As Table 5.36 shows, for Cohort 1 medium sized organisations in the public sector have been the major employer during their careers. Comparisons between the public and private sectors reveals that, for Cohort 2, the involvement between large organisations has been equally divided. In addition, for Cohort 3 the pattern is almost similar between large and medium sized organisations both in the public and private sectors. Small private organisations, particularly for Cohort 5, have been the dominant source of employment in that sector.

**Table 5.36: Percentage of non-IS career stream business sector & organisational size by cohort**

| Sector/ | Cohort 1 | Cohort 2 | Cohort 3 | Cohort 4 | Cohort 5 |
|---|---|---|---|---|---|
| **Organisation** | | | | | |
| | (n=17) | (n=14) | (n=30) | (n=27) | (n=40) |
| | % | % | % | % | % |
| **Public** | | | | | |
| Large | 35.3 | 35.7 | 23.3 | 51.9 | 17.5 |
| Medium | 58.8 | 7.1 | 13.3 | 3.7 | 2.5 |
| Small | | | | | 2.5 |
| **GBE** | | | | | |
| Large | | | 10.0 | 14.8 | |
| Medium | | | | | 2.5 |
| Small | | | 3.3 | | |
| **Private** | | | | | |
| Large | | 35.7 | 20.0 | 7.4 | 25.0 |
| Medium | | 14.3 | 13.3 | 11.1 | 17.5 |
| Small | 5.9 | 7.1 | 16.7 | 11.1 | 32.5 |

*Distribution of graduate employment geographical location non-IS career stream by cohort*

Table 5.37 shows the geographical distribution of the career histories for graduates reporting a non-IS focussed career. Broadly, nearly two thirds of the appointments reported in this career group have been in Tasmania (66.4%), Victoria (14.1%), the ACT (5.5%), New South Wales (4.7%), Australia wide (3.1%), the UK or New Zealand (each 1.6%) with minimal representation in South Australia, Queensland, Sweden and the Netherlands.

Yet again across all cohorts Tasmania has been the major source of employment. In addition, from this perspective the wider travel of the three most recent cohorts becomes evident with between five and six destinations being involved in their employment to date. In contrast, for Cohort 1 employment has been limited to either Tasmania or the ACT and for Cohort 2 the geographic distribution of their positions only includes Tasmania, Victoria and New Zealand.

**Table 5.37: Percentage of non-IS career stream geographical mobility by cohort**

| Location | Cohort 1 | Cohort 2 | Cohort 3 | Cohort 4 | Cohort 5 |
|---|---|---|---|---|---|
| | (n=17) | (n=14) | (n=30) | (n=27) | (n=40) |
| | % | % | % | % | % |
| Tasmania | 88.2 | 71.4 | 50.0 | 74.1 | 62.5 |
| Victoria | | 14.3 | 30.0 | 14.8 | 7.5 |
| ACT | 11.8 | | 13.3 | | 2.5 |
| New South Wales | | | 3.3 | | 12.5 |
| Aust wide | | | | | 10.0 |
| UK | | | | | 5.0 |
| NZ | | 14.3 | | | |
| South Australia | | | | 3.7 | |
| Queensland | | | | 3.7 | |
| Sweden | | | | 3.7 | |
| Netherlands | | | 3.3 | | |

*Positional mobility non-IS career stream by cohort*

Table 5.38 reports the results for the positional mobility for this third career stream. This shows that at least one graduate from each of the five cohorts, at the time the graduate career survey was administered, still remained in their initial post-graduation appointment. The range of appointments vary from a top total of 12 in Cohort 1, to 4 within Cohort 5.

There are two areas where these results differ from those reported earlier for the 'other' two career groups. Firstly, on average, Cohort 2 have held slightly more appointments than Cohort 1. Secondly, while for the remaining three most recent cohorts again there is only minimal variation between Cohort 4 and Cohort 5, in this instance this is also true for average number of positions making up the career histories of Cohort 3.

**Table 5.38: Non-IS career stream positional mobility by cohort**

| Cohort 1 | Cohort 2 | Cohort 3 | Cohort 4 | Cohort 5 |
|---|---|---|---|---|
| av/ range | av/range | av/range | av/range | av/range |
| 4.25 (1-12) | 4.67 (1-7) | 2.3 (1-6) | 2.0 (1-7) | 2.1 (1-4) |

*Reasons for change non-IS career stream by cohort*

To complete this level of the analysis the final aspect examines the extent to which career movement has been motivated by internal, external or 'other' change. Table 5.39 presents these results and clearly illustrates the dominance of interorganisational mobility within this non-IS related career stream. Internal reasons were most commonly reported in all but one of the graduation cohorts, although for Cohort 4 the result was equally divided between external reasons. While external reasons were the second most frequently reported influence of change for Cohort 2 and Cohort 3, for Cohort 1 was based mostly due to 'other' causes.

The exception in these results is Cohort 5 where more often their career moves have been associated with external mobility or 'other' reasons. In this group also there has been only minimal (4.7%) of internal career movement.

**Table 5.39: Non-IS career stream reasons for positional change by cohort**

| Reason | Cohort 1 | Cohort 2 | Cohort 3 | Cohort 4 | Cohort 5 |
|---|---|---|---|---|---|
| | (n=13) | (n=12) | (n=17) | (n=14) | (n=21) |
| | % | % | % | % | % |
| internal | 46.2 | 63.6 | 52.9 | 50.0 | 4.7 |
| external | 15.4 | 27.3 | 41.2 | 50.0 | 71.4 |
| other | 38.4 | 9.0 | 5.8 | | 23.8 |

### 5.8.5 Level 3: between career stream analysis summary

This section of the results has elaborated the outcomes from the previous level of analysis by incorporating career stream as an additional perspective. The demographic results that introduced this section of the results showed the link between a computer science major and a career solely focussed in the IS field. That is, over the first four graduation cohorts consistently more than half in each of these cohort groups have maintained IS careers. For Cohort 2 and Cohort 3 the hybrid career stream has been the second most frequently reported career stream. In Cohort 1 hybrid careers were equally represent with non-IS careers, while for Cohort 4 non-IS careers were the second most common career focus. For Cohort 5 (implying the IS major group), alternative, non-IS careers have been dominant followed by IS career and hybrid career streams.

#### *5.8.5.1 Career*

Within this research three areas of career focus were defined, IS career stream, hybrid career stream and non-IS career stream. These categories were applied to the work histories based on the criteria whether the work histories gathered in the graduate career survey indicated all career appointments involved IS roles, some IS positions or no IS appointments.

In summary, the results for the IS career stream have shown that:

- while fifteen potential areas of career focus were identified, for each of the five graduation cohorts the primary career focus has been either in systems development or management;
- for graduates classified in the IS career stream of the twenty-two positions classified, programmer positions have constituted nearly one quarter of all IS appointments reported by this group followed by analyst/programmer and managerial positions;
- the dominance of programmer positions has been limited to Cohort 1 to Cohort 4, which implied those with a computer science major;
- the remaining IS positional involvement was more evenly spread across a range of positions, manager, analyst/programmer, manager, analyst and graduate trainee roles.

In summary, the results for the hybrid career stream have shown that:

- the positional involvement of these graduates has been almost equally divided between IS and non-IS positions. However, when the distribution of IS and non-IS positions were examined from a time perspective it showed that non-IS roles were the dominant form of employment for three cohorts, Cohort 1, Cohort 3 and Cohort 5. IS roles were more often the primary source of employment for graduates making up Cohort 2 and Cohort 4;

- the extent of involvement in specific IS positional reported by this hybrid career stream echoes that reported within the IS career stream. However, when viewed across the five graduation cohorts this shows that the central focus in programming positions has been limited to Cohort 1 and Cohort 2;
- across the five graduation cohorts the 'other' categories was again dominant further emphasising the wide range of positions graduates have filled;
- there was a wide diversity of non-IS roles recorded by graduates making up the hybrid career stream. This was evidenced by the fact that in excess of one third of all the overall non-IS positions were classified into the 'other' category.
- the most frequently reported non-IS position was that of teacher;
- while teaching appointments were central to the non-IS positions for graduates defined in Cohort 1 and Cohort 2, in more recent times this position has declined in popularity;
- apart from the 'other' category, Cohort 5 graduates have more often worked in 'officer' roles. While this implies government positions, these are differentiated from IS involvement in CSO (computer systems officer) appointments.

In summary, the results for the non-IS career stream have shown that:

- while academic careers have been the dominant career area for Cohort 1 to Cohort 4, for Cohort 5 careers in accountancy have been the major source of career involvement to date.

#### *5.8.5.2 Work history mobility*

The results for the second aspect under scrutiny from a time perspective have shown that:

- with respect to time and career stream, the private sector has marginally been the dominant source of employment;
- with only one exception there was a similarity between business sector involvement over the four time frames and three career streams. The anomaly was for Cohort 3 where, for all three career streams, the private sector has proved the major source of career opportunities;
- when the data was reduced to size of organisation for each of the three business sectors this revealed that regardless of career stream, large public sector institutions were the major employers for Cohort 2 and Cohort 5;
- for Cohort 3 and the hybrid career stream this level of analysis also showed the increasing role of small private sector organisations as providers of graduate employment;
- in relation to geographical mobility while this reinforced the central focus of careers in Tasmania regardless of time or career stream and it has also highlighted the higher travel mobility for the IS and hybrid career streams from Cohort 3;
- while the duration of positions again as in the level 2 analysis increased incrementally between Cohort 1 and Cohort 5, this aspect of the results

revealed the hybrid career group had consistently held, on average, more positions than those classified in the IS or non-IS career stream;
- non-IS career stream graduates on average have held fewer positional appointments of the five graduation cohorts;
- the reasons for positional moved showed little consistency across the five graduation cohorts and three career streams. Cohort 4 was the only group where all three career streams recorded external causes as the major motivator of career movement. However, in this, for the non-IS career stream, the frequency was equally divided with internal reasons.

## 5.9 Level 4: analysis of results between career stream within graduation cohorts

This fourth, and final, level of the analysis offers yet a further view of the outcomes in relation to the first research question. Here the results for each of the five graduation cohorts will be separately examined. This allows an opportunity to consider the career outcomes of graduates who entered the employment market at similar periods.

In this portion of the results each cohort will be introduced by providing demographic information about the graduates making up the group. This will be based on a division into one of the three career streams and further described in terms of the numbers involved, gender and bachelor degree qualifications. Then, maintaining the common theme of the first research question, work history mobility will be examined. Within this level organisational and geographical results are combined and comparisons made between each of the three career streams within each cohort. This approach is also applied in relation to the average duration of the appointments making up the career histories within each group and also for the reasons motivating career movements.

### 5.9.1 Cohort 1 (CS major ≤1980)

This level of the results is implemented by looking at the first of the five graduation cohorts, Cohort 1. As such it potentially covers up to a twenty year period in the labour force and describes the career movements of some of the original graduates from the Department of Computer Science at the University of Tasmania. Table 5.40 provides some introductory demographic results. This shows that the results for this cohort are based on the work histories of sixteen graduates, half of whom reported careers dedicated to employment in the IS industry. Within this career stream there are seven males and one female.

The careers of the remaining eight graduates are equally divided between employment in a hybrid career stream or pursuing a career focussed in alternative areas. One female graduate has engaged in a hybrid career while 2 others have followed non-IS careers. All graduates in this cohort gained at least a Bachelor of Science degree. Conveying data of the minimum tertiary award maintains the defined scope of this research and does not imply that none of these graduates have continued to post-graduation study.

**Table 5.40: Cohort 1 career stream, gender and bachelor degree**

| | IS Career 50% (n=8) | | Hybrid career 25% (n=4) | | Non-IS career 25% (n=4) | |
|---|---|---|---|---|---|---|
| **Gender** | male | female | male | female | male | female |
| | % | % | % | % | % | % |
| | 87.5 | 12.5 | 75 | 25 | 50 | 50 |
| | | | | | | |
| **Degree:** | % | % | % | % | % | % |
| Bachelor of Science | 100 | 100 | 100 | 100 | 100 | 100 |

### *5.9.1.1 Work history mobility*

*Comparison business sector, organisational size, geographic location: Cohort 1*

As shown in Table 5.41, the results presented in this section are based on the cross referencing of those given for organisational and geographical mobility in the preceding levels of the analysis. This provides yet a further perspective of the results by describing the geographical distribution of positional involvement across business sector and different sized organisations. From this it is possible to compare how these results vary for each career stream that were established in similar time frames.

**Table 5.41: Percentage of Cohort 1 geographical mobility, business sector & organisational size**

| **Sector** | **Public** | | | **GBE** | | | **Private** | | |
|---|---|---|---|---|---|---|---|---|---|
| | large | medium | small | large | medium | small | large | medium | small |
| | % | % | % | % | % | % | % | % | % |
| **IS career stream** (n=52) | | | | | | | | | |
| ACT | 26.9 | | | | | | 1.9 | | |
| Aust wide | | | | | | | 1.9 | | |
| New South Wales | | | | | | | 5.8 | | |
| Tasmania | 25.0 | | | 1.9 | | | 15.4 | | 1.9 |
| Victoria | | | | | | | 1.9 | | |
| Singapore | | | | | | | | | 1.9 |
| UK | | 5.8 | | 1.9 | | | 7.7 | | |
| **Hybrid career stream** (n=34) | | | | | | | | | |
| New South Wales | | | | | | | | 5.9 | 2.9 |
| Queensland | | | | | | | | 2.9 | |
| Tasmania | 14.7 | 2.9 | 5.9 | | | | 2.9 | 5.9 | 2.9 |
| UK | 8.8 | | | | | | 23.5 | 11.8 | 5.9 |
| USA | | | | | | | | 2.9 | |
| **Non-IS career stream** (n=17) | | | | | | | | | |
| ACT | 11.8 | | | | | | | | |
| Tasmania | 23.5 | 58.8 | | | | | | | 5.9 |

For graduates from this cohort and classified into the IS career stream, large organisations have proved to be the dominant source of employment. Positional involvement in the public sector has been almost equally divided between the ACT or Tasmania. For this group, although representing a smaller proportion of career activity, their work in large private organisations has mostly been located in Tasmania, and, to a lesser extent, the UK or New South Wales. Graduates have also reported minimal involvement in large private organisations located in Victoria,

Australia wide or the ACT. For this IS career stream group, employment in small, private organisations has been limited working in either Tasmania or Singapore.

While large size organisations have been the major source of employment for graduates defined in the hybrid career stream, the extent of this involvement has been almost equally divided between the public and private sectors. In both cases, this has been limited to two destinations, Tasmania or the UK. Nearly one quarter of their careers have related to positions in large private organisations in the UK. When these graduates have been employed in medium sized organisations, in the public sector Tasmania was the sole location, while in the private sector they have travelled more widely both within Australia and overseas. Graduates forming this hybrid career stream have also reported minimal career involvement in Tasmania, New South Wales and also the UK

The non-IS career stream represents the least travelled and more organisationally stable group in Cohort 1. With only a minimal exception, these graduates have passed their careers to date in the public sector, predominately in Tasmania and medium sized organisations. This result reflects the considerable involvement of the earliest graduates in the state educational system. For these graduates, employment in large public sector organisations has been limited to Tasmania or the ACT.

*Positional mobility, reasons for change: Cohort 1*

Table 5.42 summarises the positional mobility of these graduates. For each of the three career streams it distinguishes the total number of appointments, the average and range of positions involved. Further, it also provides an overview of why movement occurred within each career group.

This aspect of the results clearly shows that the graduates who have followed a hybrid career have experienced greater positional mobility than the other two career groups. On average they have held 8.5 appointment which is double the number of positions reported by those pursuing non-IS careers. With an average mobility of 6.5 the results for graduates engaged in dedicated IS careers falls approximately between that reported for the other two career streams.

The range of positions for each career stream is a further area where the high positional mobility of the hybrid careerists emerges. The minimum number of appointments for this group is four, compared with one in both the IS and non-IS career categories.

The final perspective, reasons for change, also supports the greater positional movement for those following hybrid career streams. While internal movement is associated with changing positions but remaining in the same organisation, a majority of the positional mobility among this career group was based on 'other' reasons. In comparison 56.8% of the 44 career moves reported by the IS career category were reported as internally motivated. For graduates working in alternative non-IS related areas positional mobility was almost equally divided between internal (46.2%) and 'other' reasons (38.4%) for change.

**Table 5.42: Cohort 1 positional mobility & reasons for change by career stream**

| | IS Career | Hybrid career | Non-IS career |
|---|---|---|---|
| **Positions** | | | |
| total | 52 | 34 | 17 |
| average | 6.5 | 8.5 | 4.25 |
| range | 1-15 | 4-17 | 1-12 |
| | | | |
| **Reasons for change:** | **%** | **%** | **%** |
| internal | 56.8 | 10.0 | 46.2 |
| external | 18.2 | 13.0 | 15.4 |
| other | 25.0 | 76.7 | 38.4 |

### 5.9.2 Cohort 2 (CS major 1981-1985)

This second graduation cohort describes the career histories of 49 respondents who graduated with a computer science major between 1981-1985. The preliminary demographics for this group are summarised in Table 5.43. This graduation cohort consisted 43 male and 3 female graduates. All but two graduates were awarded a Bachelor of Science degree. The exceptions are both male graduates, one of whom gained a Bachelor of Surveying and the other a Bachelor of Commerce degree.

**Table 5.43: Cohort 2 career stream, gender and bachelor degree**

| | IS Career 55% (n=27) | | Hybrid career 39% (n=19) | | Non-IS career 6% (n=3) | |
|---|---|---|---|---|---|---|
| **Gender** | male | female | male | female | male | female |
| | % | % | % | % | % | % |
| | 96 | 4 | 79 | 21 | 75 | 25 |
| | | | | | | |
| **Degree** | % | % | % | % | % | % |
| Bachelor of Science | 100 | 100 | 86 | 100 | 100 | 100 |
| Bachelor of Surveying | | | 14 | | | |
| Bachelor of Commerce | | | 14 | | | |

A majority of these graduates (55%) reported IS career paths, while a total of 19 have engaged in working simultaneously between this profession and alternative positions. Only 3 non-IS career paths are included in this division of the data.

#### *5.9.2.1 Work history mobility*

*Comparison business sector, organisational size, geographic location: Cohort 2*

The previous results are now cross referenced to combine the organisation and geographical mobility for graduates defined within the second graduation cohort. Table 5.44 shows that while for all three career streams employment in large public organisations has been associated with working either in Tasmania or Victoria the extent of involvement differs. Nearly half of the appointments making up the overall career histories of the hybrid career stream in this business type have been located in Tasmania. For the IS career stream Tasmania represents the secondary source of employment and for the non-IS career stream the result is equally shared with New Zealand.

When the results for medium sized public organisations are examined this shows that for all three career streams just under 10% of the career activity for each has been

sited in Tasmania. For the non-IS stream this represents the sole destination, while for the IS and hybrid streams there has also been some involvement in the UK and in addition for the IS group, the ACT.

The limited career experiences of this graduation cohort in small public organisations has either been linked with Tasmania and the ACT for those in the IS career stream or solely in Tasmania for the hybrid stream.

For both the IS and hybrid career streams Tasmania has been the source of graduate involvement in large or medium sized GBEs. Additionally, for the IS group employment in large organisations has also extended to include Queensland, South Australia and Victoria and in medium organisations, the ACT. There is also a single example when a graduate from the career group has been employed in a small Tasmanian GBE.

The results for large private organisations shows that common locations for employment in this business sector are Tasmania and Victoria. In addition when the outcome for the IS and hybrid career streams are examined, the ACT, New South Wales and the ACT also emerge as shared destinations. For the IS career stream the distribution of employment also extends to working in multiple locations, Canada, New Zealand and the USA while one appointment held by a graduate making the hybrid career group was undertaken in Asia.

When medium or small sized businesses in the private sector are considered Tasmania yet again is a shared location between the three career groups. Additionally for the IS and hybrid career streams so also is New South Wales. For the IS career group involvement in medium sized private sector organisations has also been associated with working in the ACT or in small businesses in Victoria or Canada. Likewise graduates making up the hybrid career stream have been employed in Western Australia and in the UK or in the case of small organisations, Victoria.

**Table 5.44: Cohort 2 geographical mobility, business sector & organisational size**

| Sector | Public | | | GBE | | | Private | | |
|---|---|---|---|---|---|---|---|---|---|
| | large | medium | small | large | medium | small | large | medium | small |
| | % | % | % | % | % | % | % | % | % |
| **IS career stream** (n=145) | | | | | | | | | |
| ACT | 17.9 | 3.5 | 1.4 | | 0.7 | | 3.5 | 0.7 | |
| New South Wales | | | | | | | 1.4 | 1.4 | 0.7 |
| Queensland | 2.8 | | | 0.7 | | | | | |
| South Australia | | | | 0.7 | | | | | |
| Tasmania | 15.9 | 8.3 | 0.7 | 4.1 | 0.7 | 0.7 | 2.8 | 0.7 | 2.1 |
| Victoria | 3.5 | | | 1.4 | | | 10.3 | | 0.7 |
| Canada | | | | | | | 0.7 | | 0.7 |
| New Zealand | 0.7 | | | | | | 2.1 | | |
| NZ/Aust/Pacific | | | | | | | 0.7 | | |
| UK | | 0.7 | | | | | 2.8 | | |
| USA | | | | | | | 4.8 | | |
| **Hybrid career stream** (n=99)* | | | | | | | | | |
| ACT | 7.9 | | | | | | | | |
| New South Wales | 2.0 | | | | | | 2.0 | 1.0 | 1.0 |
| Tasmania | 42.6 | 8.9 | 1.0 | 2.0 | 1.0 | | 4.0 | 3.0 | 9.0 |
| Victoria | 1.0 | | | | | | 6.9 | | 1.0 |
| Western Australia | | | | | | | | 2.0 | |
| Asia | | | | | | | 1.0 | | |
| UK | | 1.0 | | | | | 1.0 | 1.0 | |
| **Non-IS career stream** (n=14) | | | | | | | | | |
| Tasmania | 14.3 | 7.1 | | | | | 28.6 | 14.3 | 7.1 |
| Victoria | 7.1 | | | | | | 7.1 | | |
| New Zealand | 14.3 | | | | | | | | |

*adjusted to reflect 2 cases of missing data

*Positional mobility, reasons for change: Cohort 2*

Table 5.45 shows the number of positions contained within the career histories of this graduation cohort along with the reported reasons for changing appointments. This shows that graduates engaged in an IS or semi IS career stream, on average have held just over 5 appointments compared with 4.67 for those pursuing non-IS related careers.

When the reasons for changing positions are considered, the majority of movement among those in the IS career group has been externally motivated. For the remaining two career streams change mostly has occurred for internal reasons. Among the hybrid group however, external and 'other' reasons were also frequently the attributed cause.

**Table 5.45: Cohort 2 positional mobility & reasons for change by career stream**

| | IS Career | Hybrid career | Non-IS career |
|---|---|---|---|
| **Positions** | | | |
| total | 145 | 101 | 14 |
| average | 5.4 | 5.3 | 4.7 |
| range | 1-9 | 3-13 | 1-7 |
| | | | |
| **Reasons for change:** | % | % | % |
| internal | 40.7 | 40.2 | 63.6 |
| external | 49.1 | 35.4 | 27.3 |
| other | 10.2 | 24.3 | 9.0 |

### 5.9.3 Cohort 3 (CS major 1986-1990)

The third graduation cohort contains the employment histories of 83 graduates, 16 of whom are women. Some preliminary demographics for this group summarised in Table 5.46. Following the trend established in the two earlier graduation cohorts, again a majority of the careers involve an IS focus. This is true for 60% of graduates of which 12 % are women. Bachelor of Science remains the dominant award and once again Bachelor of Surveying and Bachelor of Commerce are represented. However for these graduates the Bachelor of Surveying is associated with an IS focussed career while the Bachelor of Commerce award has been the basis for careers in each of the three career streams. For the first time in the within graduation cohort results Arts, Engineering and Economics degrees are introduced. The single combined Bachelor of Laws/Science degree in the data set is also within this cohort.

**Table 5.46: Cohort 3 career stream, gender and bachelor degree**

| | IS Career 60% (n=50) | | Hybrid career 24% (n=20) | | Non-IS career 16% (n=13) | |
|---|---|---|---|---|---|---|
| **Gender** | male | female | male | female | male | female |
| | % | % | % | % | % | % |
| | 80 | 20 | 80 | 20 | 85 | 15 |
| | | | | | | |
| **Degree** | % | % | % | % | % | % |
| Bachelor of Science | 90 | 90 | 44 | 100 | 46 | 50 |
| Bachelor of Surveying | 2.5 | | | | | |
| Bachelor of Commerce | 5 | | 25 | | 18 | 50 |
| Bachelor of Arts | 2.5 | 10 | 6 | | | |
| Bachelor of Engineering | | | 25 | | 18 | |
| Bachelor of Economics | | | | | 9 | |
| Bachelor of Laws/Science | | | | | 9 | |

#### *5.9.3.1 Work history mobility*

Table 5.47 provides a cross reference perspective of organisational and geographical mobility for the third graduation cohort. Before considering these results, it needs to be noted that 1.9% of the data for the IS career stream are not included because this refers to cases where graduates have worked in a combination of organisational types.

*Comparison business sector, organisational size, geographic location: Cohort 3*

As shown for all three career streams graduate employment in large public organisations has involved being based in Tasmania, the ACT and Victoria. In

addition, graduates classified in the IS and hybrid career streams have also worked in New South Wales and South Australia. For those making up the IS group their associations with this organisational type has also extended to Queensland and Malaysia. Similarly, graduates from the hybrid career stream have been employed in Antarctica or divided between this location and Tasmania.

The remaining public sector career activity for the IS career stream related to two locations, Tasmania and South Australia. While they have worked in both medium and small organisations in Tasmania, in South Australia the appointment was in a medium sized business in the public sector. Graduates making up the hybrid and non-IS career groups have worked in this same employment category in Tasmania and for the first stream a position in a small public company in Victoria was also reported.

All three career groups have had some associations with large Tasmanian GBEs and in addition, for the IS and hybrid career streams activity in such organisations has been located in New South Wales. Graduates in the IS career group have also worked in similar establishments in Victoria. The non-IS career stream is the only group in this graduation cohort to have reported any involvement in small sized GBEs and this relates to a position based in New South Wales.

The initial results for large private organisations shared a commonality in relation to Tasmania, New South Wales and Victoria. In addition those in the IS career group have also been employed in similar organisations based Australia wide, in Queensland, South Australia and Western Australia. Outside Australia their involvement also extends to New Zealand, the Philippines, Singapore and the UK. For those making up the hybrid career group the remainder of the geographical distribution in these organisations has been in Hong Kong, the UK, the USA, Germany and Japan. The single position reported in large private organisations beyond the three Australian states relates to one located in the Netherlands.

Overall, Tasmania is the only common location for employment in medium and small sized private organisations. For the IS and hybrid career streams this is also true in relation to New South Wales, while graduates following non-IS careers have worked in both sized businesses in the private sector but based in Victoria. Graduates making up the IS career stream have also found employment in medium sized private organisations in the ACT, Australia wide, Queensland, South Australia and the UK. For the hybrid career group the remainder of their career involvement in this business type has be abroad in the USA, the UK, Japan and Indonesia. The remaining geographical distribution for career activity in small privates organisations for the IS career group related to Queensland, Victoria and Indonesia. These results are more diverse with the hybrid career stream and include Queensland, the Northern Territory, NT/PNG, WA/Queensland, Switzerland, Belgium, Fiji, Canada, Thailand and France. The sole remaining location for the non-IS career stream is a position located in the ACT.

**Table 5.47: Cohort 3 geographical mobility, business sector & organisational size**

| Sector | Public | | | GBE | | | Small | | |
|---|---|---|---|---|---|---|---|---|---|
| | large | medium | small | large | medium | small | large | medium | small |
| | % | % | % | % | % | % | % | % | % |
| **IS career stream** (n=212) | | | | | | | | | |
| ACT | 8.0 | | | | | | | 0.5 | |
| Australia wide | | | | | | | 0.9 | 3.8 | |
| New South Wales | 1.9 | | | 3.3 | | | 8.5 | 1.4 | 3.8 |
| Queensland | 0.9 | | | | | | 2.4 | 0.5 | 0.5 |
| South Australia | 0.5 | 0.5 | | | | | 1.9 | 2.4 | |
| Tasmania | 15.6 | 3.8 | 0.5 | 3.3 | | | 1.4 | 1.4 | 2.8 |
| Victoria | 3.8 | | | 0.9 | | | 13.2 | | 1.4 |
| Western Australia | | | | | | | 0.5 | | |
| Indonesia | | | | | | | | | 0.5 |
| Malaysia | 0.5 | | | | | | | | |
| New Zealand | | | | | | | 0.9 | | |
| Philippines | | | | | | | 0.5 | | |
| Singapore | | | | | | | 0.5 | | |
| UK | | | | | | | 3.8 | 0.5 | |
| **Hybrid career stream** (n=94) | | | | | | | | | |
| ACT | 1.1 | | | | | | | | |
| Antarctica | 1.1 | | | | | | | | |
| New South Wales | 1.1 | | | 1.1 | | | 3.3 | 1.1 | 2.2 |
| Northern Territory | | | | | | | | | 1.1 |
| NT/PNG | | | | | | | | | 1.1 |
| Queensland | | | | | | | | | 3.3 |
| South Australia | 2.2 | | | | | | | | |
| Tas/Antarctica | 1.1 | | | | | | | | |
| Tasmania | 6.6 | 7.7 | | 12.1 | | | 4.4 | 5.5 | 12.1 |
| Victoria | 2.2 | | 1.1 | | | | 4.4 | | |
| Aust wide | | | | | | | | | 1.1 |
| Belgium | | | | | | | | | 1.1 |
| Canada | | | | | | | | | 1.1 |
| Fiji | | | | | | | | | 1.1 |
| France | | | | | | | | | 1.1 |
| Germany | | | | | | | 1.1 | | |
| Hong Kong | | | | | | | 2.2 | | |
| Indonesia | | | | | | | | 1.1 | |
| Japan | | | | | | | 2.2 | 1.1 | 2.2 |
| Switzerland | | | | | | | | | 3.3 |
| Thailand | | | | | | | | | 1.1 |
| UK | | | | | | | 1.1 | 1.1 | |
| USA | | | | | | | 1.1 | 1.1 | |
| **Non-IS career stream** (n=30) | | | | | | | | | |
| ACT | 10.0 | | | | | | | | 3.3 |
| New South Wales | | | | | 3.3 | | 10.0 | | |
| Tasmania | 10.0 | 13.3 | | 10.0 | | | 6.7 | 6.7 | 3.3 |
| Victoria | 3.3 | | | | | | 10.0 | 6.7 | 10.0 |
| Netherlands | | | | | | | 3.3 | | |

*Positional mobility, reasons for change: Cohort 3*

As revealed in Table 5.48, the positional mobility among graduates engaging in IS and semi IS career streams from Cohort 3 is almost the same. Those solely engaging in IS roles on average have held 4.24 appointments while graduates in the hybrid career stream reported 4.7. For this subgroup also, unlike IS and non-IS career streams, all graduates have moved from their initial positions. That is, the range of

positions within the hybrid career stream is 2-15 while for the remaining career groups contains examples where graduates still remain in their first position.

Each career group differs in their reported reasons for moving positions. For the IS career stream the majority have changed for external reasons. Within the hybrid careerists internal, external and 'other' explanations are almost equally distributed, while non-IS graduates have more frequently left for either of the first two reasons.

**Table 5.48: Cohort 3 positional mobility & reasons for change by career stream**

| | IS Career | Hybrid career | Non-IS career |
|---|---|---|---|
| **Positions** | | | |
| total | 212 | 94 | 30 |
| average | 4.2 | 4.7 | 2.3 |
| range | 1-12 | 2-15 | 1-6 |
| | | | |
| **Reasons for change:** | % | % | % |
| internal | 30.4 | 29.7 | 52.9 |
| external | 55.2 | 33.7 | 41.2 |
| other | 14.3 | 36.5 | 5.8 |

### 5.9.4 Cohort 4 (CS major 1991-1995)

Table 5.49 shows 67% of the 73 respondents falling within this graduation cohort, to the time the graduate career survey was administered, have pursued careers dedicated to working as IS professionals. This career stream, reports the career histories of 39 males and 10 female graduates. As such of all the preceding divisions by graduation cohort, this contains the greater proportion of female graduates. This is not true in the other two career streams where women graduates are among the minority. The dominant degree is yet again a Bachelor of Science being the bachelor qualification for 43 of the 49 graduates reporting an IS dedicated career. The six exceptions are awards equally distributed between Bachelor of Surveying, Bachelor of Economics and Bachelor of Computing.

Within the graduates classified to be in a hybrid career stream, once again a Bachelor of Surveying and Bachelor of Economics are again also represented with the addition of one Bachelor of Commerce graduate. Nine graduates holding a Bachelor of Science have been engaged in other than IS oriented careers along with others from Economics, Engineering and Bachelor of Computing backgrounds.

**Table 5.49: Cohort 4 career stream, gender and bachelor degree**

| | IS Career 67% (n=49) | | Hybrid career 15% (n=11) | | Non-IS career 18% (n=13) | |
|---|---|---|---|---|---|---|
| **Gender** | male | female | male | female | male | female |
| | % | % | % | % | % | % |
| | 80 | 20 | 82 | 18 | 92 | 8 |
| | | | | | | |
| **Degree** | | | | | | |
| Bachelor of Science | 92 | 70 | 56 | 100 | 67 | 100 |
| Bachelor of Surveying | 5 | | 22 | | | |
| Bachelor of Economics | | 20 | 11 | | | |
| Bachelor of Engineering | | | | | 17 | |
| Bachelor of Commerce | | | 11 | | 8 | |
| Bachelor of Computing | 3 | 10 | | | 8 | |

### *5.9.4.1 Work history mobility*

*Comparison business sector, organisational size, geographic location: Cohort 4*

Table 5.50 presents these results and initially the geographical distribution of employment in large public sector organisations is examined. In this section of the results for the fourth graduation cohort there are also some minor omissions because the organisational involvement is not mutually exclusive. For IS career stream 0.8% is not shown as it relates to public/private medium sized organisations in Tasmania and similarly within the hybrid career stream results 2.3% has been omitted due to appointments simultaneously based in large public/GBEs.

Table 5.50 shows that yet again for all three career streams in this business category Tasmania has proved to be the dominant site of positions to an extent of representing approximately one third of the overall results within each career group. Graduates making up the IS and non-IS career streams have also worked in similar organisational types in Victoria, while the IS and hybrid streams have held positions in the ACT. The remaining locations for the IS career group are New South Wales and South Australia, while for the Non-IS group a portion of the career activity has been sited in Sweden.

Tasmania is also the common geographical location in relation to employment in medium sized public organisations. IS career stream graduates have also worked in similar business structures located in the ACT, New South Wales and the USA and in addition provided the only example in this graduation cohort of employment in small public organisations. This relates to two appointments both of which were in Tasmania.

Graduate involvement in large GBEs has mainly been limited to within Tasmania and only the IS and non-IS career streams.

When the results for large private organisations are considered, apart from Tasmania there are no overall similarity in locations. However IS and hybrid career stream graduates have both had some career activity in Victoria. Graduates making up the IS group have also reported appointments in the ACT, New South Wales and the UK as have the hybrid stream in South Australia and the non-IS career group in Queensland.

Overall for all three career streams appointments have been held in Tasmanian private medium and small sized businesses. In addition for the IS career stream working in medium sized organisations has also been associated with appointments located in New South Wales, the UK and in the USA. For both the hybrid and non-IS career streams South Australia is the only location beyond Tasmania where they have reported involvement in this organisational type.

The remaining geographical distribution of appointments in small private organisation for the IS career stream have been located in Victoria, New South Wales and Germany and for the hybrid career group in South Australia, Victoria and the UK.

**Table 5.50: Cohort 4 geographical mobility, business sector & organisational size**

| **Sector** | **Public** | | | **GBE** | | | **Private** | | |
|---|---|---|---|---|---|---|---|---|---|
| | large | medium | small | large | medium | small | large | medium | small |
| | % | % | % | % | % | % | % | % | % |
| **IS career stream** (n=126) | | | | | | | | | |
| ACT | 4.0 | 2.4 | | | 0.8 | | 0.8 | | |
| New South Wales | 1.6 | 1.6 | | | | | 3.2 | 2.4 | 5.6 |
| South Australia | 0.8 | | | | | | | | |
| Tasmania | 31.8 | 4.0 | 1.6 | 2.4 | | | 4.8 | 6.4 | 10.3 |
| Victoria | 0.8 | | | 0.8 | | | 2.4 | | 3.2 |
| Germany | | | | | | | | | 0.8 |
| UK | | | | | | | 1.6 | 3.2 | |
| USA | | 1.6 | | | | | | 1.6 | |
| **Hybrid career stream** (n=42) | | | | | | | | | |
| ACT | 2.4 | | | | | | | | |
| Northern Territory | | | | | | | | 2.4 | |
| South Australia | | | | | | | 2.4 | | 2.4 |
| Tasmania | 35.7 | 4.8 | | | | | 9.5 | 7.1 | 11.9 |
| Victoria | | | | | | | 4.8 | | 9.5 |
| UK | | | | | | | | | 4.8 |
| **Non-IS career stream** (n=27) | | | | | | | | | |
| Queensland | | | | | | | 3.7 | | |
| South Australia | | | | | | | | 3.7 | |
| Tasmania | 33.3 | 3.7 | | 14.8 | | | 3.7 | 7.4 | 11.1 |
| Victoria | 14.8 | | | | | | | | |
| Sweden | 3.7 | | | | | | | | |

*Positional mobility, reasons for change: Cohort 4*

As shown in Table 5.51, within this cohort again graduates pursuing hybrid careers on average have reported nearly 4 positional changes compared with 2.6 among those engaged in the IS career stream and 2 in alternative career paths.

**Table 5.51: Cohort 4 positional mobility & reasons for change by career stream**

| | IS Career | Hybrid career | Non-IS career |
|---|---|---|---|
| **Positions** | | | |
| total | 126 | 42 | 27 |
| average | 2.6 | 3.9 | 2.0 |
| range | 1-6 | 1-6 | 1-7 |
| | | | |
| **Reasons for change:** | % | % | % |
| internal | 37.7 | 35.5 | 50.0 |
| external | 41.6 | 38.7 | 50.0 |
| other | 20.4 | 25.8 | |

Graduates within the IS career stream have most often moved for external reasons. This is also marginally the case with hybrid careerists. For those following non-IS careers equally external or internal the reasons for changing positions are reported.

### 5.9.5 Cohort 5 (IS major 1991-1995)

This graduation Cohort 5 contains the work histories of 37 of the original cohort of IS major students to graduate from the Department of Computer Science. These results are provided in Table 5.52 which shows that by gender this group is almost equally distributed, containing responses from 20 male and 17 female graduates. In contrast to the results for the earlier, computer science major based cohorts, just over half of these graduates have followed alternative, non-IS related careers. This result is almost equally divided between male (27%) and female (24%) graduates. Of the remaining graduates 27% reported an IS dedicated career, while 22 have engaged in a hybrid career stream. In addition, within this cohort only two Bachelor of Science degrees are represented. These were awarded to women graduates who completed an IT major. One has subsequently worked as an IS professional, while the other has followed a hybrid career stream.

**Table 5.52: Cohort 5 career stream, gender and bachelor degree**

| | IS Career 27% (n=10) | | Hybrid career 22% (n=8) | | Non-IS career 51% (n=19) | |
|---|---|---|---|---|---|---|
| **Gender** | male | female | male | female | male | female |
| | % | % | % | % | % | % |
| | 60 | 40 | 50 | 50 | 53 | 47 |
| | | | | | | |
| **Degree** | | | | | | |
| Bachelor of Science | | 25 | 25 | | | |
| Bachelor of Education | 17 | | | | | |
| Bachelor of Economics | 17 | 25 | 25 | | | 22 |
| Bachelor of Arts | 33 | 50 | | 100 | 20 | 67 |
| Bachelor of Commerce | 33 | | 50 | | 80 | 11 |

#### *5.9.5.1 Work history mobility*

*Comparison business sector, organisational size, geographic location: Cohort 5*

Table 5.53 shows a combined, comparative view of the results in relation to the organisational and geographical mobility of the initial group of information systems major graduates. It is evident that with only one exception their career involvement in both the public and GBE sectors has been located in Tasmania. The single

variation is in the non-IS career stream, where one position in a large public organisation was based in the ACT.

When the results for large private organisations are examined, then Tasmania and New South Wales emerge as destinations common to all three career streams. For both the IS and hybrid career streams appointments associated with this organisational type have also been located in Victoria. The single overseas appointment in this particular business structure was reported by a graduate classified in the non-IS career group where the destination was in the UK.

In contrast to the results for the hybrid and non-IS career streams, for the IS career stream no appointments in Tasmania were reported in medium sized private organisations where instead career activity has been focussed in New South Wales. Again, in the non-IS career group one position was reported in the UK.

In the results for geographical distribution of employment in small private organisations again Tasmania is an exclusion but this time in relation to the career activities of graduates classified within the hybrid career stream. For this career group the only association with this structure of organisation has been in the UK. Graduates from both the IS and non-IS career streams reported positions in Tasmania. In addition for the first career group there has been one appointment in New South Wales and for the non-IS career group three appointments in Victoria.

**Table 5.53: Cohort 5 geographical mobility, business sector & organisational size**

| Sector | Public | | | GBE | | | Private | | |
|---|---|---|---|---|---|---|---|---|---|
| | large | medium | small | large | medium | small | large | medium | small |
| | % | % | % | % | % | % | % | % | % |
| **IS career stream** (n=21) | | | | | | | | | |
| New South Wales | | | | | | | 19.1 | 9.5 | 4.8 |
| Tasmania | 23.8 | 9.5 | | 14.3 | | | 4.8 | | 4.8 |
| Victoria | | | | | | | 9.5 | | |
| **Hybrid career stream** (n=24) | | | | | | | | | |
| New South Wales | | | | | | | 4.2 | | |
| Tasmania | 41.7 | | | 8.3 | 8.3 | | 16.7 | 4.2 | |
| Victoria | | | | | | | 12.5 | | |
| UK | | | | | | | | | 4.2 |
| **Non-IS career stream** (n=40) | | | | | | | | | |
| ACT | 2.5 | | | | | | | | |
| Aust wide | | | | | | | | | 10.0 |
| New South Wales | | | | | | | 12.5 | | |
| Tasmania | 15.0 | 2.5 | 2.5 | | 2.5 | | 10.0 | 15.0 | 15.0 |
| Victoria | | | | | | | | | 7.5 |
| UK | | | | | | | 2.5 | 2.5 | |

*Positional mobility, reasons for change: Cohort 5*

The results for the positional mobility this graduation cohort again support the trend to higher mobility amongst graduates who have engaged in hybrid careers. As Table 5.54 shows on average this career stream have experienced 2.75 positional changes compared with just over 2 for the other two career groups.

**Table 5.54: Cohort 5 positional mobility & reasons for change by career stream**

| | IS Career | Hybrid career | Non-IS career |
|---|---|---|---|
| **Positions** | | | |
| total | 21 | 24 | 40 |
| average | 2.2 | 3.0 | 2.1 |
| range | 1-3 | 1-4 | 1-4 |
| | | | |
| **Reasons for change:** | % | % | % |
| internal | 54.5 | 43.7 | 4.7 |
| external | 27.3 | 31.3 | 71.4 |
| other | 18.2 | 25.0 | 23.8 |

Within the non-IS career stream external reasons were the most commonly reported explanation why positional moved occurred. Whereas in the IS or hybrid career categories graduates recorded internal reasons were more frequently cited as the basis for changing appointments.

### 5.9.6 Level 4: between career streams within graduation cohort analysis summary

This final level of analysis for Research Question 1 has considered the results from a perspective of the three potential career streams within each of the five graduation cohorts. This aspect has provided some insight into the career patterns of graduates who have entered the labourforce at similar times over a twenty year period.

#### *5.9.6.1 Career*

For each of the five graduation cohorts, the focus of career involvement can be summarised as follows:

- half of the graduates making up Cohort 1 have reported a career solely based in working in an IS capacity, with the remainder divided between hybrid and non-IS careers;
- more than half of graduates defined in Cohort 2 have pursued IS careers, while 39% have intermittently worked as IS professionals and only 6% have engaged in alternative, non-IS careers;
- nearly two thirds of Cohort 3 graduates have reported IS careers, 24% hybrid careers and 16% non-IS careers;
- just over two thirds of graduates defined in Cohort 4 have maintained IS careers, while the proportional distribution between hybrid and non-IS careers in the earlier cohorts has changed. For this group slightly more graduates have taken up non-IS related careers rather than hybrid careers;
- against the trend for the dominance of IS careers among graduates with computer science majors, more than half of those making up Cohort 5 have established careers in non-IS related areas. While IS careers have represented the second career stream for this group, the difference between this and hybrid careers has only been marginal;
- from this perspective women graduates have been in the minority in all but two of the fifteen data divisions. In these two exceptions (Cohort 1, non-IS career stream and Cohort 5, hybrid career stream) they have been equally represented;

- while all those making up Cohort 1 gained Bachelor of Science degrees, in the more recent cohorts a wider diversity of degree areas have been represented.

*5.9.6.2 Work history mobility*

At this finer level of detail it was possible to cross reference business sector, organisation size and geographical career involvement. The outcomes for work history mobility from a Level 4 perspective have shown:

- that the work history mobility of Cohort 1 graduates who have exclusively followed an IS focussed career has tended to have been largely centred in large public sector organisations in either the ACT or Tasmania;
- the dominant focus of hybrid careers among Cohort 1 graduates has been in large private organisations in the UK;
- more than half of the non-IS careers Cohort 1 graduates have pursued have been in medium size government organisations in Tasmania;
- that for Cohort 2 the primary focus of IS careers in large public organisations has continued, although to a lesser extent, to be in the ACT or Tasmania;
- nearly half of the hybrid careers reported by Cohort 2 graduates has been in large public sector organisations within Tasmania;
- large, private sector organisations in Tasmania have provided over one quarter of the appointments reported by Cohort 2 graduates pursuing non-IS careers;
- while large public sector organisations in Tasmania have provided the bulk of career appointment for Cohort 3 graduates engaged in IS careers, large private organisations have emerged as a secondary significant source of career appointments;
- for the hybrid group making up Cohort 3, while Tasmania has still proved the major site of employment, a larger proportion of positions have been in small, private sector organisations;
- the results for the non-IS career group in Cohort 3 are diverse. The distribution of work history mobility has been both in the public and private sectors with four main geographical locations, the ACT, New South Wales, Tasmania and Victoria. Within the ACT and Tasmania this has mostly been in large government or semi-government (GBEs) institutions. A higher proportion of positional appointments in New South Wales or Victoria have been in the private sector, either in large or small businesses;
- in Cohort 4 for each of the three career streams nearly one third of appointments have been in large public sector organisatons in Tasmania. In addition, regardless of career stream evidence has emerged of the increasingly important role of small businesses in Tasmania as a source of graduate career opportunities;
- of the Cohort 5 graduates who have reported IS careers have more frequently worked in Tasmania in large public sector organisations, nearly one third of positions for this group have been in the private sector. While largely these appointments have been in large organisations in

Tasmania, they have also reported career involvement worked in medium and small businesses in New South Wales and Victoria;

- similarly, large public sector organisations in Tasmania have been central to Cohort 5 graduates who have intermittently worked in an IS capacity with large private sector companies in Tasmania, New South Wales and Victoria providing the secondary source of career appointments;
- nearly two thirds of Cohort 5 graduates who reported non-IS related careers have been in Tasmania. These have been distributed both in the public and private sectors. In the public sector large organisations have proved the dominant source of employment while in the private sector medium and small organisations have been significant employers;
- in Cohort 1, the hybrid career stream has been the most highly mobile career stream, followed by the IS career stream and the non-IS career stream. Graduated defined in the hybrid career stream more often moved positions based on external reasons while for the other two career streams career movement was most often cited as promoted by internal career movement;
- for Cohort 2, differences in the extent of positional mobility between the three career streams was less marked than in Cohort 1. This second graduate group reporting IS careers more often changed positions citing external cause, while for the remaining career streams career movement was driven by internal change;
- in Cohort 3 the number of career appointments, on average, was similar while the non-IS career stream graduates were clearly the least mobile group. Graduates pursuing IS careers reported external reasons as the major cause of career movement, in the hybrid career group this was attributed to other causes, while for the non-IS career group change was driven by internal job shifts;
- there were some similarities and differences in positional mobility and reasons for change in the results for Cohort 4. The hybrid career group had held a slightly higher number of appointments, on average than the other two career streams. External cause dominated in this cohort, although for the non-IS career stream this was equally divided with internal reasons for career movements;
- in Cohort 5 graduates making up the hybrid career stream were the most mobile of the three career streams. While change in positional appointments was internally driven for the IS and hybrid career streams, over two thirds of the positional changes in the non-IS career group were externally motivated.

## 5.10 Summary

In this chapter the results that address the first research question have been presented. It has been based on the examination of the work histories reported by graduates and also, where appropriate, reference has been made to the IS newspaper recruitment survey. The four levels of analysis have followed the prescribed process established in the framework:

- Level 1 - overview;
- Level 2 - between graduation cohorts;

- Level 3 - between career streams;
- Level 4 - between career streams within graduation cohorts.

These four levels of analysis have encompassed issues related to the two major issues under scrutiny in Research Question 1, career focus and work history mobility.

**Question 1: Career history**
*With a particular focus on career and work history mobility, what are the career experiences of graduates from the Department of Computer Science at the University of Tasmania who gained a bachelor degree based on a major in either computer science or information systems?*

To recap the aim of the first aspect, career focus, was to gauge the extent to which tertiary qualifications in computer science and information systems promoted careers in the IS industry. This was seen as providing a practical contribution to the problem in the industry of a chronic shortage of skilled IS personnel.

In relation to career focus, the broad level analysis of the data showed that a majority of the graduates participating in the graduate career survey have maintained careers in the IS industry. When the results were viewed from a Level 3 between cohort career stream perspective, then this revealed that this outcome has been limited to the first four graduation cohorts. Consequently this result is seen as establishing a link between a computer science major and a career exclusively based in IS. Importantly, in response to the shortage of skilled IS personnel, the extent of IS career involvement across these four time cohorts has increased to represent in excess two thirds of the careers reported by the most recent Cohort 4 group.

In contrast, the results for the foundation information systems major Cohort 5 showed that the primary focus of careers for this graduation group to be in alternative non-IS areas. For this graduation group IS careers were the second most frequently reported area of career focus slightly ahead of hybrid careers.

While the scope of IS positional titles reported was wide, more generally the larger proportion of these were limited to three areas of work activity, programmer, analyst/programmer and managerial appointments. This outcome was supported from a demand perspective in the results from the IS newspaper recruitment survey. Due to the considerable involvement of graduates defined in the IS career stream in these three roles, systems development activities were identified as the main area of IS career focus. At a lower level of detail this outcome was found to have been limited to the first three cohorts. Graduates making up Cohort 4 have more often worked towards IS management careers while in Cohort 5 the main areas of career focus have been divided between management and systems development.

Overall a further 24% of graduates reported working intermittently in an IS capacity. Obviously, this outcome also has implications for the problem of the shortage of skilled IS personnel. A significant outcome in the hybrid career stream results is that the frequency of IS or non-IS role involvement has been almost equally divided. The increasing extent of computer science major graduates maintaining IS careers, with only the exception of Cohort 1, has been offset by a trend for a decrease in the extent of hybrid careers for Cohort 2, Cohort 3 and Cohort 4. Hybrid careers have proved

the least popular of the three career stream options for graduates making up the foundation IS major, Cohort 5 group.

Approximately 20% of graduates respondents to the graduate career survey indicated engaging in careers in non-IS areas. Apart from graduates defined in this career stream in Cohort 1 there was evidence of a link between bachelor degree and subsequent career choice. While all Cohort 1 graduates who contributed work history details similarly gained a Bachelor of Science, the extent of their uptake of teaching careers has demonstrated the influence of the Education Department Scholarships that were offered to tertiary students during this period.

The four level analysis of work history mobility have provided an opportunity to follow through from the higher level results and determine the influences of time and career focus in the results for Research Question 1. For example, in relation to the organisational career involvement of these graduates, while initially there appeared to have been an almost equal division between the two major business sectors subsequent perspectives of the data have provided a more informative insight. Taken together with the outcomes for the geographical distribution of career appointments, the results have indicated that small private sector organisations have increasingly become a source of employment opportunities for these graduates. With only one exception, and directly opposed to the results from the IS newspaper survey, Tasmania has been the dominant work destination for graduates and this has been shown to have largely been associated with large public sector organisations. The lower levels of analysis have also revealed the decline in popularity of the UK and the ACT as sites of career involvement for graduates. In more recent years when graduates have left Tasmania, then they have tended to relocate to the larger Australian population centres, New South Wales and Victoria.

Graduates classified in the hybrid career stream, especially those within Cohort 3 have proven to be the most highly mobile group both in terms of travel and positional mobility. While across the four views of the results there have been some commonality of patterns for positional change, more generally the results could not isolate any one of the three reasons as more prevalent in the work histories of these graduates.

The chapter reported the results for Research Question 1 which was established to specifically address two key problematic features associated with the IS industry, the chronic shortage of skilled IS personnel and a perception that mobility among these workers was far higher in comparison with other labour force sectors. Based on graduate careers spanning up to a twenty year period, these issues have been examined from a number of perspectives.

The chapter to follow will report the results for Research Question 2 which re-examines the two key themes of career and career mobility, but this time focussing specifically on the initial post graduation appointment. This period is not only an integral component in a career, but as a milestone event in a career, the memory of positive and negative outcome persist to govern future career decisions and movement (Baker 1991). Consequently, the experiences of graduates at this point in their careers have important implications for labour problems in the IS industry.

# CHAPTER SIX: results relevant to Research Question 2

## 6.1 Introduction

The aim of this chapter is to address the second research question, dedicated to the initial post-graduation employment experiences of graduates. This has already been established to be a milestone event in a career and, as such, the experiences of graduates within this stage in a career can have long term implications for subsequent career decisions (Morrison 1969); (Kaufman 1974). Primarily, Chapter Six will contain three sections:

- analytic framework;
- event history analysis;
- results for research question two.

In this chapter, the presentation of the results will also follow a second, purposefully constructed, analytic framework. Within this, in keeping with the objectives of the second research question, the themes of career and work history mobility, will again be repeated. However, here the focus will be limited to data in relation to the first appointment in the work histories reported by graduates. As also proposed by the research question, additional results to be examined will be the duration of this appointment, the means graduates used to gain the appointment, and also the criteria they applied when deciding to accept the position.

These three aspects are highly significant in relating the outcomes from this stage in a career. Given the reportedly high mobility of graduates embarking on their careers (Brennan & McGeevor 1988); (Mabey 1986); (McGregor 1991) and, more especially, those starting off as IS professionals (Igbaria & Greenhaus 1992b); (Martin & Shell 1988), these results are an important aspect of this research. The approach to finding work and also the basis for taking up a particular appointment are also key issues in this stage of a career (Arnold & MacKenzie Davey 1992), especially in view of the high amount of 'reality shock' experienced by many IS graduates when making the transition into the labour market (Trauth, Farwell & Lee 1993); (Smits, McLean & Tanner 1997).

## 6.2 Analytic framework

For the second research question three levels of analysis are presented. As table 6.1 shows, for Research Question 2, three levels of analysis will be conducted. Namely:

- Level 1 - overview;
- Level 2 - between graduation cohorts;
- Level 3 - IS, non-IS role involvement.

Once again the primary source of data for the results is the graduate career survey and, when appropriate, the IS newspaper recruitment survey.

**Table 6.1: Research Question 2 - analytic framework**

| Q2: *With reference to the initial post-graduation appointments and with a particular focus on original career choice, business sector and geographic location, how did graduates approach gaining and accepting the position and what is the extent of their mobility when engaged in this role?* | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Level 1 (§6.4): Overview** | | | | | | | | | | |
| Initial IS, non-IS role involvement | | | | | | | | | | |
| IS entry level recruitment positions | | | | | | | | | | |
| Work history mobility | | | | | | | | | | |
| *Means of finding initial appointment* | | | | | | | | | | |
| *Acceptance criteria* | | | | | | | | | | |
| Extent of mobility initial appointment | | | | | | | | | | |
| Reasons for change | | | | | | | | | | |
| **Level 2 (§6.5): Between graduation cohort** | CS =<1980 | | CS 1980-1985 | | CS 1986-1990 | | CS 1991-1995 | | IS 1991-1995 | |
| Initial IS, non-IS position titles | | | | | | | | | | |
| *IS entry level recruitment demand* | | | | | | | | | | |
| Work history mobility | | | | | | | | | | |
| *Means of finding initial appointment* | | | | | | | | | | |
| *Acceptance criteria* | | | | | | | | | | |
| Extent of mobility initial appointment | | | | | | | | | | |
| Reasons for change | | | | | | | | | | |
| **Level 3 (§6.6): Initial IS, non-IS role involvement** | IS | Non | IS | Non | IS | Non | IS | Non | IS | Non |
| Work history mobility | | | | | | | | | | |
| *Means of finding initial appointment* | | | | | | | | | | |
| *Acceptance criteria* | | | | | | | | | | |
| Extent of mobility initial appointment | | | | | | | | | | |
| Reasons for change | | | | | | | | | | |

(shading indicates IS recruitment data)

## 6.3 Event History Analysis

The question 'How long did graduates remain in their first appointment?' creates a dilemma in that when sampling occurs, a number may still be engaged in that position. That is, the event has not yet happened. On the one hand it is simply not feasible to extend research and wait until all graduates have terminated the position. Conversely, to base results on data that includes these graduates will produce erroneous results, while to exclude them will introduce bias and outcomes that are not representative (Willett & Singer 1991).

Event history or survival analysis is an appropriate statistical technique to overcome this problem. While there is considerable support in the literature for its application in career and employment research (Allison 1984); (Devine 1998); (Willett & Singer 1991); (Yaffee & Austin 1994) it does not appear to have been applied in IS career research (with the exception of an undefined application of right censoring (Wagner & Benham 1993)). For the purpose of this aspect of the results in this research, event history analysis will be applied as it addresses this fundamental problem in time sampling. It provides the technique to address the situation by combining censored and uncensored data in a single analysis (Norusis 1994). Censored cases are defined as those for whom the event has not yet occurred, while uncensored describes those who have already left. Described simply, the data are mathematically transformed to firstly establish a survivor function and a hazard function which then form the basis to produce a meaningful outcome of duration. The hazard function detects changes in the survivor function to indicate above normal reductions. As such it accurately identifies time frames where there is a greater risk of change (those seeking a more detailed l explanation of the derivation of this statistic are directed to Norusis (Norusis 1994)).

In addition, the survival life table application provided in SPSS software also provides the ability to statistically compare for differences between grouped cases using the Wilcoxon (Gehan) test (Norusis 1994). Within this research it will be applied using the three defined career streams to test the null hypothesis that survival time distributions are the same for each career category group.

## 6.4 Level 1: overview analysis of the results for Research Question 2

*With reference to the initial post-graduation appointment and with a particular focus on original career choice, business sector and geographic location, how did graduates approach gaining and accepting the position and what is the extent of their mobility when engaged in this role?*

The results presented in this portion of the results describe a total sample population of 251 cases. This adjustment is based on one of the assumptions underlying the research design, which recognised that potentially for some graduates the initial post-graduation job did not necessarily represent the commencement of their professional career. That is, an interim position was accepted to provide income during the job search process. In determining such cases, to ensure an increased accuracy of the data, roles that were difficult to distinguish as being in this category have been included, whereas others, more obviously fitting this criteria have been excluded.

### 6.4.1 Initial career focus

The distribution of graduates between IS and non-IS positions as shown in Figure 6.1, indicates nearly two thirds of those participating in the survey indicated their first post-graduation appointment involved working in an IS role.

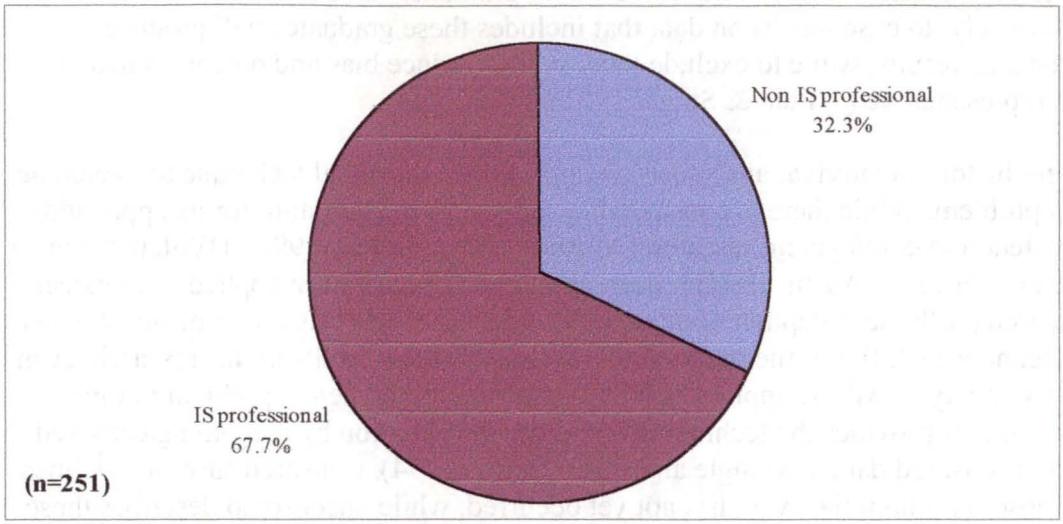


**Figure 6.1: Graduates grouped by initial career focus**

#### *6.4.1.1 Initial career focus and gender*

Figure 6.2 shows the initial career focus by gender which also reveals that a larger proportion of male than female graduates began their careers working in an IS capacity.

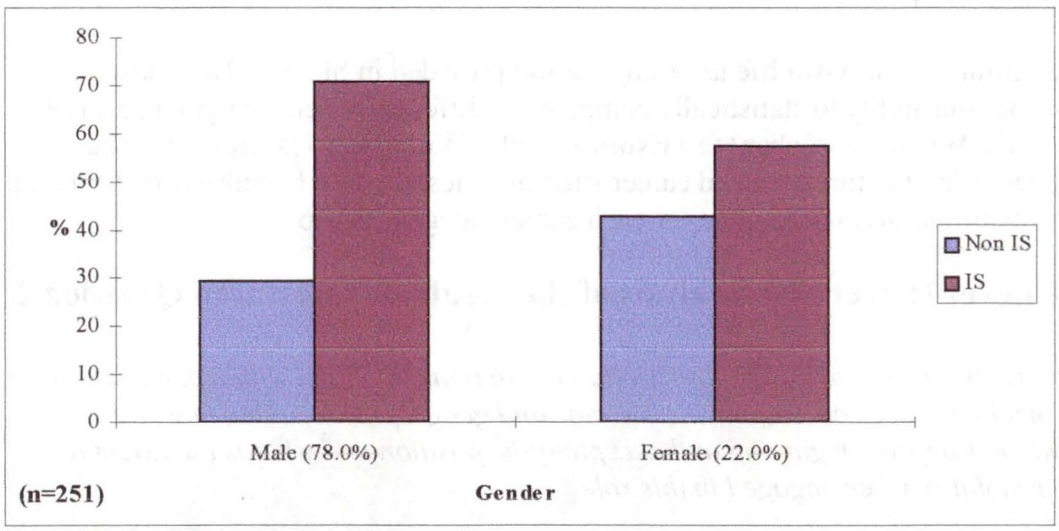


**Figure 6.2: Initial career focus by gender**

#### *6.4.1.2 Degree qualifications and initial IS appointment*

A further perspective of the distribution of IS positional involvement examines the extent to which graduates from the different bachelor degree qualifications have gone on to initiate their careers in the IS profession. These results are shown in Figure 6.3, where it should be noted that the sample has been adjusted to describe a total of 246 work histories. This reflects the exclusion of three minimal degree areas: Bachelor of Computing, Bachelor of Education and Bachelor of Laws/Science. In the first, two of

the three graduates from this background launched their careers in the IS industry, as did the sole respondent who gained a bachelor of education. As already stated in the previous chapter, the graduate who completed a combine Bachelor of Laws/Science degree continued on to pursue a career in the legal profession.

It also needs to be pointed out that there are different numbers of graduates within each degree category. For example, while it is reported that 83% of surveying graduates started their careers in an IS role, this only relates to 2% of the overall respondents. Even so, what this aspect of the results does emphasise is that 80% of the major data contributing group (Bachelor of Science) launched their careers working as IS professionals.

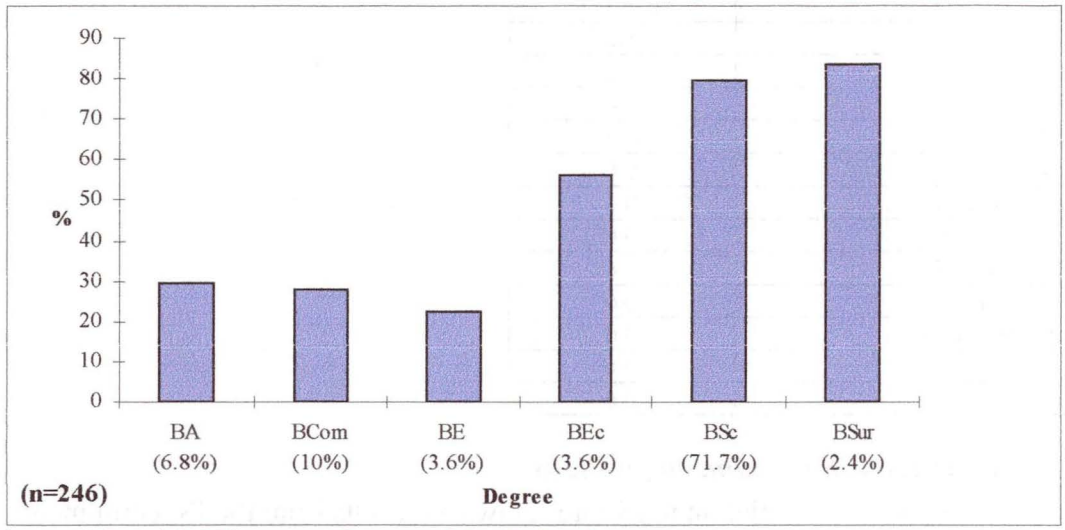


**Figure 6.3: Initial IS career focus and bachelor degree**

### *6.4.1.3 Initial IS role title*

Table 6.2 shows the extent to which graduates reported involvement within a total of 24 initial IS roles. Again, as with the results obtained in relation to the first research question, these have largely focussed in a small number of areas. Similarly also, the dominant role has been programming, with decreasing work involvement working as analyst programmers, CSOs, consultants or engineers. From here there are only minimal distributions between the remaining 19 positions that were reported. In addition, it has already been established earlier that many levels of management appointments are involved in the data. So while this role is represented in these results as an entry level appointment, it may not imply an accelerated career. It also needs to be pointed out that CSO (computer systems officer) roles indicate government 'officer' appointments where the respondent indicated this involved working in an IS capacity.

**Table 6.2: Entry level IS roles**

| IS role | |
|---|---|
| | (n=170) |
| | % |
| programmer | 40.6 |
| analyst programmer | 13.0 |
| CSO | 11.2 |
| consultant | 5.9 |
| engineer | 5.3 |
| support | 3.5 |
| DBA | 3.5 |
| teacher | 2.4 |
| analyst | 1 8 |
| manager | 1 7 |
| trainer | 1 2 |
| tutor | 1.2 |
| assistant | 1.2 |
| help desk | 0.6 |
| coordinator | 0.6 |
| lecturer | 0.6 |
| network analyst | 0.6 |
| software officer | 0.6 |
| PD research fellow | 0.6 |
| sales executive | 0.6 |
| computer scientist | 0.6 |
| technician | 0.6 |
| webmaster | 0.6 |

#### *6.4.1.4 Entry level IS recruitment positions*

A second perspective in relation to IS roles draws on results from the IS recruitment survey. For the purposes of the results for the second research question, a revised total of 2315 advertisements are involved, to reflect an adjustment limited to entry level positions. As Table 6.3 shows, while the highest number of vacancies were for programmers, the difference between this role and the combined analyst/programmer positions is only minimal. Together these two appointments accounted for nearly two thirds of the IS positions on offer. The next most frequently offered positions were those for analysts or computer systems officers. There were slightly less employment opportunities for engineering, support and consultant roles and only minimal representation between the remaining eight titles.

**Table 6.3: IS entry level recruitment**

| IS role | |
|---|---|
| | (n=2315) |
| | % |
| programmer | 30.1 |
| analyst/programmer | 29.3 |
| analyst | 13.7 |
| CSO | 9.9 |
| engineer | 4.0 |
| support | 2.5 |
| consultant | 2.2 |
| specialist | 1.9 |
| professional | 1.7 |
| DBA | 1.6 |
| auditor | 1.4 |
| designer | 1.0 |
| supervisor | 0.4 |
| technologist | 0.2 |
| instructor | 0.2 |

#### *6.4.1.5 Initial non-IS role titles*

For graduates who entered the labour force in a non-IS position, the most frequently reported role was that of teacher. As shown in Table 6.4 this result is true for just under 20% of the graduates making up this career division. The next most frequently reported position was that of an officer, a category established where graduates indicated a role in the government business sector that involved other than IS duties. Other areas where there has been some common involvement were in accounting, management and engineering. To a lesser extent this is also some overlap for the next nine roles, while the remainder are singularly represented.

**Table 6.4: Initial position non-IS appointments**

| Non-IS roles (n=81) | % |
|---|---|
| teacher | 18.5 |
| officer | 11.1 |
| accountant | 8.6 |
| manager | 7.4 |
| engineer | 6.2 |
| clerk | 4.9 |
| graduate | 4.9 |
| assessor | 2.5 |
| auditor | 2.5 |
| PD research | 2.5 |
| scientist | 2.5 |
| support | 2.5 |
| tutor | 2.5 |
| analyst | 2.5 |
| actuarial trainee | 1.2 |
| administrator | 1.2 |
| chef | 1.2 |
| croupier | 1.2 |
| draftsman | 1.2 |
| enterprise facilitator | 1.2 |
| solicitor | 1.2 |
| geophysical operator | 1.2 |
| lecturer | 1.2 |
| production stager | 1.2 |
| sales | 1.2 |
| security | 1.2 |
| supervisor | 1.2 |
| surveyor | 1.2 |
| technician | 1.2 |
| tester | 1.2 |
| trainer | 1.2 |

## 6.4.2.Work history mobility

### *6.4.2.1 Distribution of graduate initial employment by business sector*

The first aspect of work history mobility considers the business sector where graduates reported obtaining their first career appointment. Figure 6.4 graphically shows that regardless of initial career focus, slightly more than half of these graduates began their careers working in the public sector. At the same time, a further one third found employment in the private sector and, of the remainder, 9% were employed within GBEs and 1% worked across business sectors. This last category refers to contract work and simultaneous involvement between sectors.

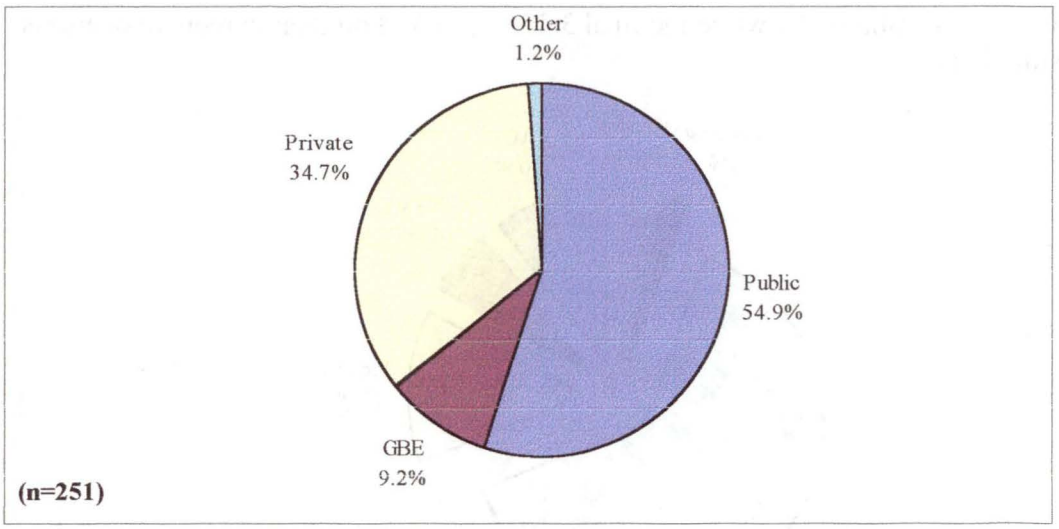


**Figure 6.4: Business sector - initial appointment**

### *6.4.2.2 Distribution of graduate initial employment by size of organisation*

To consider in more detail the business sector involvement of graduates, Table 6.5 shows the distribution when the data are further differentiated according to organisation size. Overall, this shows that nearly half of these graduates began their careers working in large public sector organisations. The extent of this involvement is nearly double that in the same size organisations in the private sector, where a further 20% reported their initial appointment. In addition, while in the public and GBE sectors, the distribution of positions decreases across the three sizes involved, in the private sector small business was the source of slightly more positions than medium sized companies.

**Table 6.5: Initial position by business sector & organisational size**

| **Business sector/ organisation** | |
|---|---|
| | (n=251) |
| | % |
| **Public** | |
| large | 42.2 |
| medium | 10.8 |
| small | 2.0 |
| **GBE** | |
| large | 8.0 |
| medium | .8 |
| small | .4 |
| **Private** | |
| large | 20.3 |
| medium | 6.0 |
| small | 8.4 |
| **Other** | 1.20 |

### *6.4.2.3 Distribution of graduate initial employment by geographical location*

Having established the distribution of graduate employment according to business sector, the next aspect considers where these appointments were located. Figure 6.5 shows the geographical distribution of graduates within their initial post-graduation appointment. This reveals that nearly two thirds began their careers in Tasmania, then in decreasing order of distribution, in Victoria, the ACT and New South Wales. In addition, a minimal number of positions were located in the remaining Australian

States or Australia wide, while the final 3.2% embarked on their careers in overseas destinations.

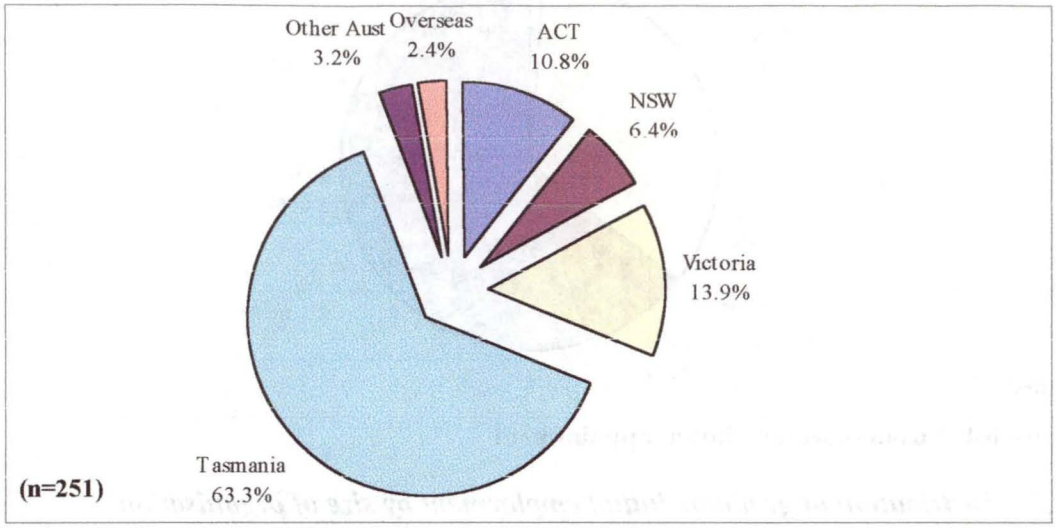


**Figure 6.5: Geographical distribution initial appointment**

In relation to the second research question two highly relevant feedback issues are the means graduates used when seeking employment and also the criteria they more commonly applied when deciding the accept a position.

### 6.4.3 Means of finding initial career appointment

The results for the first aspect are presented in Figure 6.6. Following Arnold and MacKenzie Davey (Arnold & MacKenzie Davey 1992) this includes five categories plus an 'other' classification. The results presented in this section are based on 303 responses which indicates that a number of graduates used more than one approach. At this overview level the most popular source was newspaper recruitment advertisements. In decreasing frequency this was then followed by enlisting the assistance of the University campus careers office, being offered employment, personally approaching potential employers or the extension of existing employment. The 'other' category is made up of a range of responses, and within these, the most frequently cited were the public service entrance examination, use of career consultancies, trade journals, mail lists and web sites.

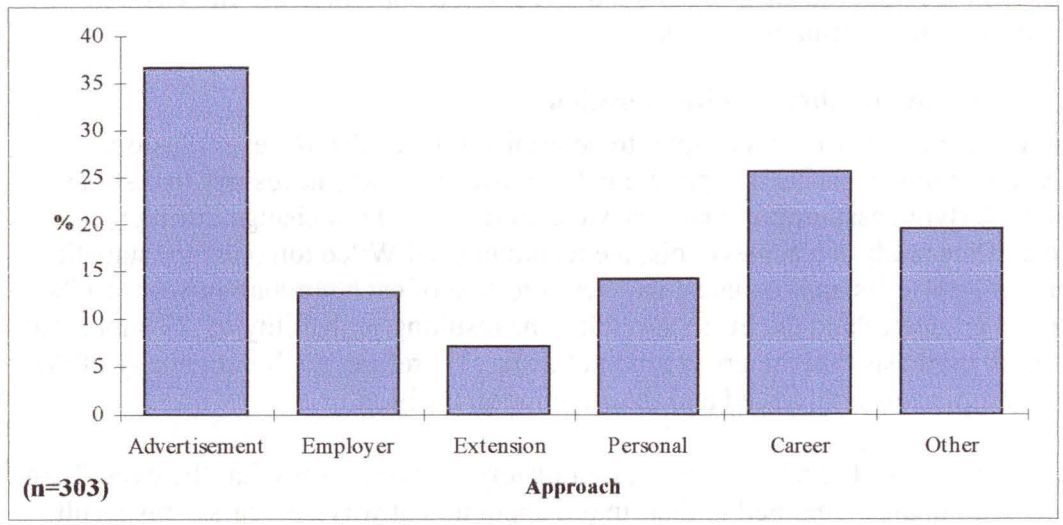


**Figure 6.6: Approaches to obtaining initial appointment**

### 6.4.4 Acceptance criteria

The second aspect examines the reasons graduates used when deciding to accept the position. In this section the total number of responses was 707 and implies that graduates were more likely to base their choice of a multiple number of factors. Again, the established categories follow Arnold and MacKenzie Davey (Arnold & MacKenzie Davey 1992) and, in addition, an 'other' category to follow through on other potentially influential factors. As Figure 6.7 shows, career prospects were the dominant influence determining acceptance, with just under 70% of graduate respondents agreeing to that criterion. In addition, slightly more than half supported location as a highly influential factor. The perceived profile of the employer organisation was used as acceptance criteria by slightly less than half of these graduates, salary was an incentive for 30%, with the extent of technology, access to training and 'other' reasons almost similar motivators. The least common incentive was the offer of travel within the course of employment.

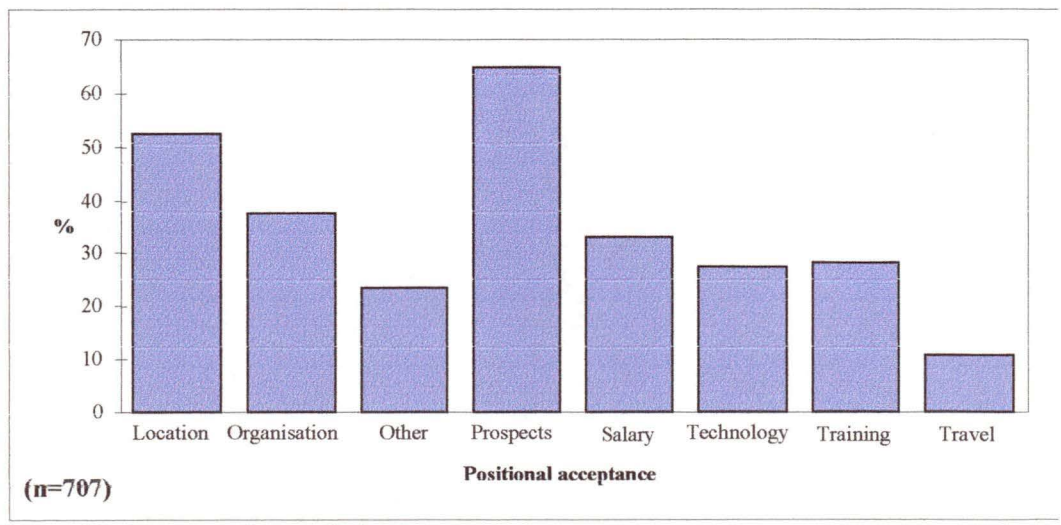


**Figure 6.7: Reasons determining acceptance**

The final sections of the results from an overall perspective consider change, both in terms of how long graduates remained in their initial appointments and also one of three reasons motivating the career move.

### 6.4.5 Extent of mobility in initial position

As introduced earlier in this chapter to determine this results, the event history analytic technique has been applied. Firstly, however, it was necessary to test the basic underlying assumption that survival experience did not change during the course of the study. To achieve this, the recommended Wilcoxon (Gehan) statistic (Norusis 1994) was applied using an overall testing of each graduation year (1978-1996) of graduates and the event variable. The resulting probability of .77 supported the null hypothesis that the groups did not differ. Therefore, the homogeneity of the target sample was established and the assumption fulfilled.

The application of life tables within event history analysis shows that the overall, on average, graduates remained in their initial appointment was 2.3 years. This result was based on 208 uncensored and 43 censored observations. That is, of the graduates who participated in the career survey, approximately one fifth were still engaged in their initial post-graduation appointment. It also shows that, to date, the longest a graduate has remained in the initial appointment was 16 years. This outlier was removed and the test rerun, which determined it did not effect the original result.

### 6.4.6 Reasons for change

Figure 6.8 provides details of the reasons graduates cited for leaving their initial appointment. This shows that 38% of movement was driven by external reasons. As established within the context of this thesis, this implies the change involved taking up employment with a new organisation. For the remaining graduates, just over a quarter vacated the position to take up a new role with the existing employer, while the final 34% were equally divided between either 'other' reasons or 'else not applicable'. This last category describes the group for whom this event had not yet happened.

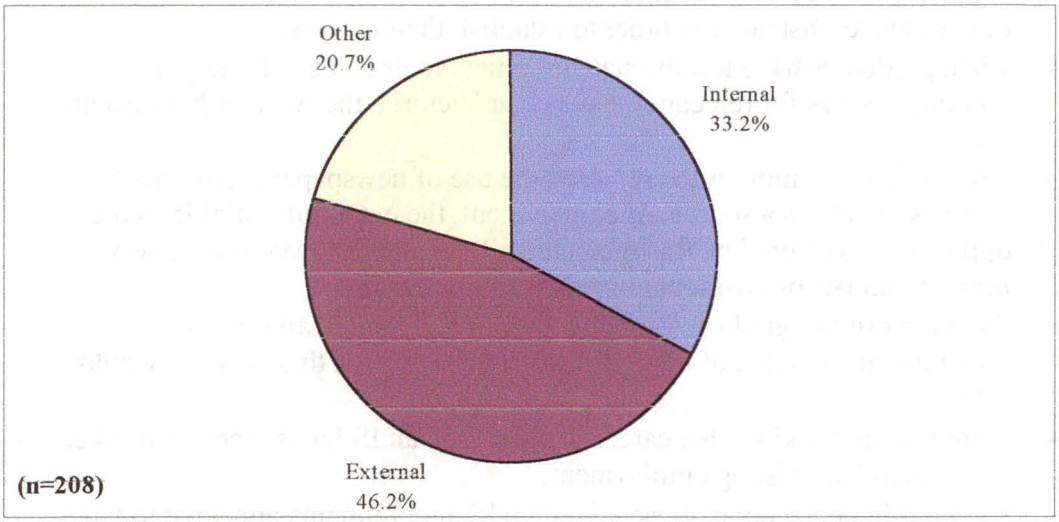


**Figure 6.8: Reasons for job change**

### 6.4.7 Level 1: overview summary

In keeping with the defined objective within the analytic framework purposefully established to guide an analysis of the results for Research Question 2, at this level the results have been examined at an overview level. To summarise, this level of analysis has generalised the outcomes as follows. For the first aspect under examination, initial career focus, it has shown that:

#### *6.4.7.1 Initial career focus*

- a majority of graduates, to the extent of in excess of two thirds, have initiated their careers in an IS capacity;
- a greater proportion of male graduates than female graduates commenced their careers working in an IS capacity;
- a total of seven areas of bachelor degrees are represented in initial careers in the IS industry;
- the most commonly reported IS entry level positions have been that of programmer and, to a lesser extent, analyst/programmer or CSO (computer systems officer). This outcome was supported by the results from the IS newspaper recruitment survey;
- graduates whose degrees involved an information systems major more frequently began their careers working as CSOs;
- graduates who launched their careers in alternative, non-IS areas have more frequently been employed as teachers, officers (implying government, non-IS related appointments) or, reflecting the influence of primary degree area, accountants.

#### *6.4.7.2 Work history mobility initial appointment*

- while over half of these graduates initiated their careers in the public sector, the private sector, to an extent of a further one third, has proved the starting point for graduate careers;
- regardless of business sector, large organisations have proved central to the initial career opportunities for graduates;

- against the commonly accepted view, a larger proportion of these graduates did not leave Tasmania in order to establish their careers;
- when graduates have left the state to initiate their careers, largely the secondary areas for relocation have been Victoria, the ACT or New South Wales;
- while graduates more often reported the use of newspaper recruitment advertisements as a source of employment, the extent of initial IS career opportunities offered by this medium in Tasmania, showed only a very limited number of positional openings in the industry;
- the main criteria graduates applied to decide taking up an offered appointment was that of the prospects they perceived this position would offer;
- graduates embarking on a career in other than an IS focus were more likely to have extended existing employment;
- from a role perspective, those taking up IS appointments appeared to have been more proactive in assessing the positions of offer. Their foremost criteria was technology, followed almost equally by job prospects, salary and training;
- overall, the application of event history analysis showed that, on average, graduates remained in their initial appointment for a period of 2.4 years;
- largely at this Level 1 analysis, graduates more commonly moved out of their initial position to take up appointments with a new employer organisation and a further one quarter reported change as being motivated by internal career movement.

## 6.5 Level 2: analysis of results between graduation cohorts

Within this section, the results are reported from a cohort perspective which implies a division of the data into the five time categories as established in §5.7. Following the prescribed analytic framework this offers an opportunity to consider the initial career experiences of graduates who have entered the labour force at different times of the twenty year sampling period.

### 6.5.1 Work history mobility

#### *6.5.1.1 Distribution of graduate initial employment: business sector by cohort*

The next issue examined is the industry sector where graduates, making up the five cohorts, have established their professional careers. Table 6.6 shows that for Cohort 1 and Cohort 2, the public sector has clearly been the dominant source of initial employment. While this is also true for the remaining two computer science major cohorts, within this period the extent of involvement between the public and private sector has lessened. For these earliest cohorts the extent of involvement represented between 70% to 90%, whereas in the more recent cohorts this has decreased to represent just under or just over half the appointments in the public sector. Cohort 5 continues to be the exception in this perspective of the results, with exactly half of these graduates reporting they began careers in the private sector.

**Table 6.6: Business sector by cohort**

| | Cohort 1 | Cohort 2 | Cohort 3 | Cohort 4 | Cohort 5 |
|---|---|---|---|---|---|
| | n=16 | n=48 | n=81 | n=72 | n=34 |
| | % | % | % | % | % |
| **Public** | 87.5 | 70 8 | 45 7 | 55. 6 | 38.2 |
| **GBE** | | 12.5 | 12 4 | 5. 6 | 8 8 |
| **Private** | 12.5 | 16.7 | 42.0 | 36.1 | 50.0 |
| **Other** | | | | 2.8 | 2.9 |

### *6.5.1.2 Distribution of graduate initial employment: business sector and size of organisation*

Table 6.7 extends the previous results to show the distribution of employment in the different sized organisations within the business sectors. For computer science major graduates (implying the first four cohorts) the main focus of the initial career activity is again confirmed and, is now shown to have mostly been in large establishments. For Cohort 5, the private sector business and also large businesses, have been the source of nearly one third of the initial appointments reported by this group. When the results are viewed from this perspective, the emerging role of small, private businesses as providers of initial career appointments for graduates becomes apparent.

**Table 6.7: Business sector & organisational size by cohort**

| | Cohort 1 | Cohort 2 | Cohort 3 | Cohort 4 | Cohort 5 |
|---|---|---|---|---|---|
| | n=16 | n=48 | n=81 | n=72 | n=34 |
| | % | % | % | % | % |
| **Public** | | | | | |
| large | 62 5 | 52.1 | 35 8 | 44 4 | 29.4 |
| medium | 18.8 | 16.7 | 9.9 | 8.3 | 5.9 |
| small | 6 3 | 2.1 | | 2.8 | 2.9 |
| **GBE** | | | | | |
| large | | 10 4 | 11.1 | 5 6 | 5.9 |
| medium | | 2.1 | 1.2 | | |
| small | | | | | 2.9 |
| **Private** | | | | | |
| large | 6.3 | 10.4 | 27.2 | 16.7 | 32.4 |
| medium | 6.3 | 2.1 | 7.4 | 6 9 | 5.9 |
| small | | 4.2 | 7 4 | 12.5 | 11 8 |
| **Other** | | | | 2.8 | 2.9 |

### *6.5.1.3 Distribution of initial post graduate appointment by geographical location*

Figure 6.9 provides yet another aspect of geographical mobility in relation to the initial career appointment. It follows through on the overall distribution provided in Figure 6.5. In this further division of the data, the earlier results are repeated in the *x* axis (location). Viewed from this perspective the results show that while the ACT was a popular source of initial employment for graduates making up Cohort 2 and Cohort 3, in more recent times this has not proved to be the case. New South Wales has attracted many of those graduates making up Cohort 4, while Victoria has been central to the careers of many of those defined in Cohort 3. Tasmania, the results from a cohort perspective show initial graduate employment to have been similarly distributed for the three middle cohorts. Cohort 3 graduates have also been shown to be more inclined to travel when establishing their careers, in particular relocating in Australia to the remaining states or else overseas.

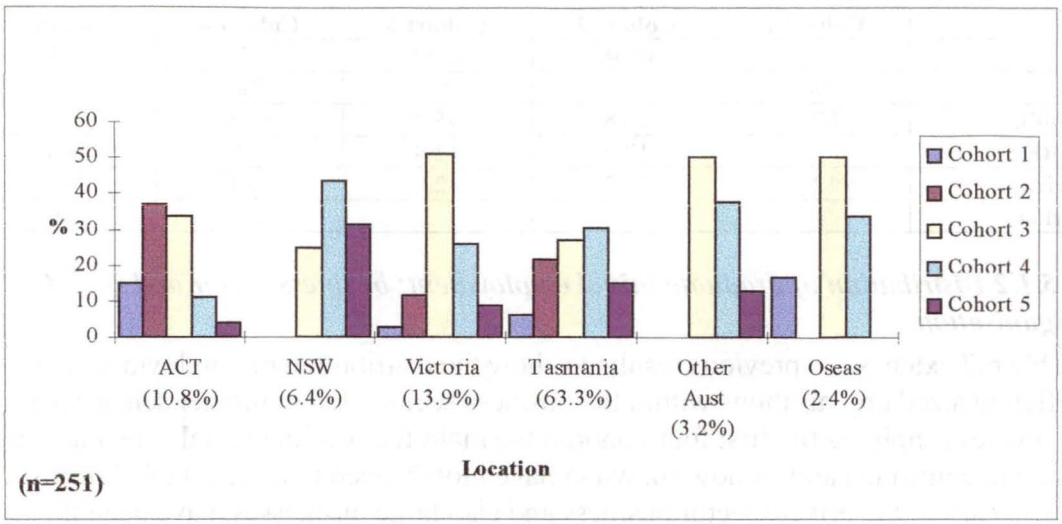


**Figure 6.9: Geographic distribution of employment by cohort**

### 6.5.2 Means of finding initial appointment

Figure 6.10 demonstrates the changing patterns, over time, in the means graduates have used when seeking their initial appointment. It clearly shows that graduates making up the two most recent cohorts have more heavily relied on newspaper advertisements as a source of employment. However, those classified in Cohort 3 made extensive use of the University careers office, whereas, the original computer science group most often cited 'other' means. This is not surprising given the extent to which these graduates were recipients of Education Department scholarships and, as a consequence, were bonded to be employed as teachers for the initial period of their careers. Although graduates making up Cohort 2 mostly sought employment through newspaper recruitment, they also appear to be the group that drew widely across these available means of assistance.

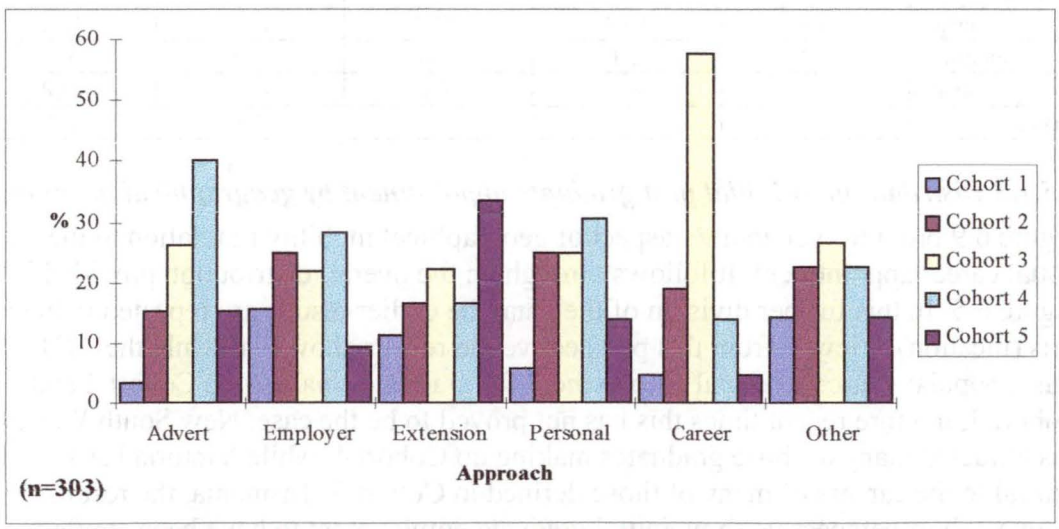


**Figure 6.10: Means used to gain appointment by cohort**

### 6.5.3 Acceptance criteria

The reasons behind initial career choice are also examined from a time perspective. As Figure 6.11 shows, the prospects perceived in a particular appointment have

proven to be the dominant consideration. However, again supporting the significant influence of Education Department scholarships, the major criteria among Cohort 1 was attributed to 'other' factors. Location emerged as being an important issue, especially for Cohort 2, Cohort 3 and Cohort 4. Across all five cohorts, a focus on the organisation has remained relatively consistent. To the same extent, for Cohort 3 and Cohort 4, salary has proved to be one of the key decision criteria. Cohort 4 graduates had a greater interest in obtaining training than any of the remaining cohort groups. Travel has been perceived by all cohort groups to be the least influential incentive guiding positional acceptance.

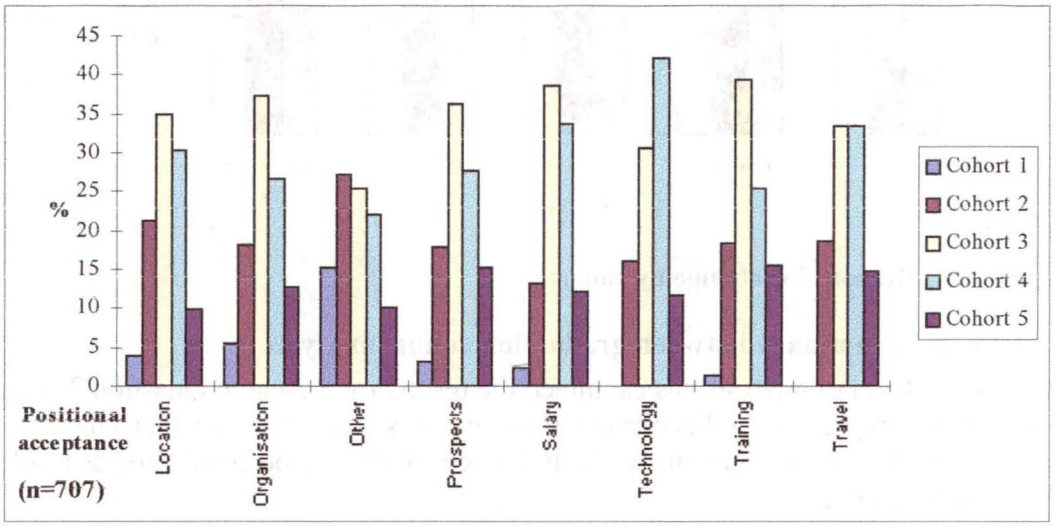


**Figure 6.11: Positional acceptance criteria by cohort**

### 6.5.4 Extent of mobility in initial position

The extent of mobility, from a cohort perspective is shown in Table 6.9.This indicates that generally, over time, there is a slight trend for mobility to be reducing, however, the Wilcoxon (Gehan) statistic shows that the extent of differences between these cohorts is not significant. Cohort 1, on average, remained in their initial appointment for 2.2 years this has increased to approximately two and a half years for Cohort 3 and Cohort 5, while the results for Cohort 2 and Cohort 4 are in between, with averages at 2.3 and 2.3 consecutively.

**Table 6.9: Position averages by cohort**

| Cohort 1 | Cohort 2 | Cohort 3 | Cohort 4 | Cohort 5 |
|---|---|---|---|---|
| average survival | average survival | average survival | average survival | average survival |
| 2.2 | 2.3 | 2.5 | 2.3 | 2.5 |

(4df p = .6844)

### Reasons for change

The final results in relation to the bottom level of analysis for the second research question, examines the reasons graduates reported for moving out of the position when viewed by graduation cohort. Figure 6.12 shows these results and identifies that for Cohorts 2, Cohort 3 and Cohort 5, the most commonly cited motivator was due to external cause. For Cohort 4, however, not only was there a marginal difference between internal and external career movement, in this instance, on slightly more occasions, change was attributed to internal cause. Yet a further variation is the result for Cohort 1. The reasons cited for leaving the initial

appointment was equally divided between internal or 'other' reasons with only 20% of change in that group prompted by external career moves.

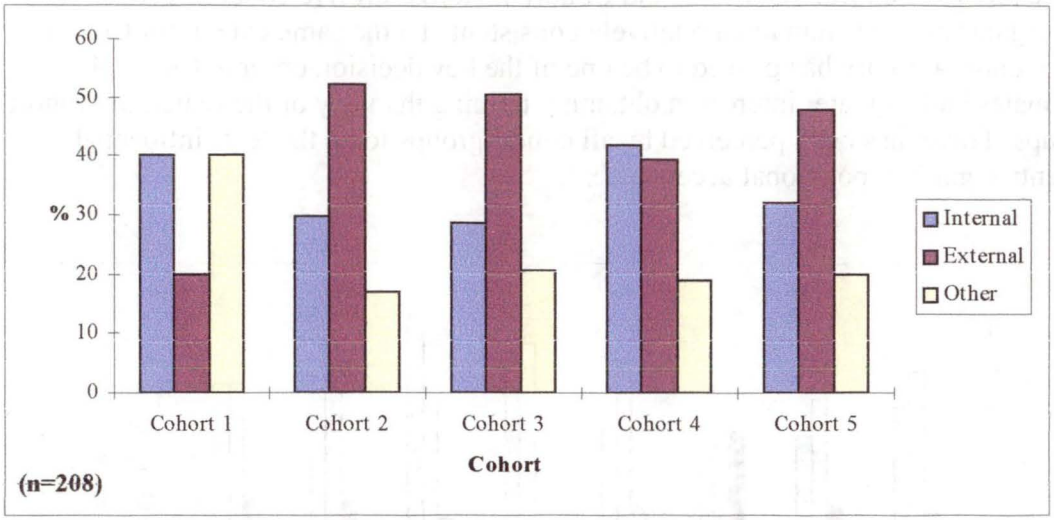


**Figure 6.12: Reasons for change by cohort**

### 6.5.5 Level 2: summary between graduation cohort analysis

This second level of analysis has examined the results for Research Question 2 taken from a time perspective. In this portion of the analysis areas of career focus have been purposefully omitted to enable the influences of time to be considered as a sole intervening variable.

#### *6.5.5.1 Work history mobility – initial position*

To summarise this portion of the results has shown that:

- from a time perspective the larger proportion of graduates completing a computer science major have embarked on their careers in large public sector organisations;
- the primary focus for information systems major graduates, at this initial stage in their careers, has been in large private companies;
- Tasmania has consistently been the geographical location where graduates have initiated their careers;
- while the ACT was a highly popular destination for Cohort 2 graduates, more recent graduates have tended to move to New South Wales or Victoria;
- 'other' criteria have more consistently been reported as the means of gaining their first professional career appointment;
- Cohort 4 graduates have emerged as the graduation group that have used multiple means of obtaining employment. These graduates have almost equally applied the six options for job search provided in the graduate career survey;
- with the exception of the 'other' category, Cohort 3 and Cohort 4 have, by comparison with the remaining cohorts, applied a wider range of the given criteria when deciding positional acceptance;
- Cohort 1 graduates were clearly not interested in technology and travel as incentives to accept their initial career appointment;

- there was no clear pattern between cohorts for moving out of their initial position although for Cohort 1, in keeping with the previous dot point result, 'other' reasons dominated;
- the average time in the initial position between graduation cohorts ranged from 2.2 to 2.5 years. The Wilcoxon (Gehan) test subsequently showed this difference not to be statistically significant.

## 6.6 Level 3: analysis between IS and non-IS initial career focus

The final perspective in relation to the results from the second research question considers outcomes when the data are divided between an initial focus in either and IS or a non-IS appointment. Figure 6.13 shows that, within each of the first four cohorts (implying a major in computer science), between 68% to 75% of graduates embarked on their careers in an IS positional role. However, the extent of such involvement peaked in Cohort 3, and it slightly decreased among graduates making up Cohort 4. In direct contrast, 70% of the initial career focus for the original IS major, Cohort 5, has been in non-IS related areas.

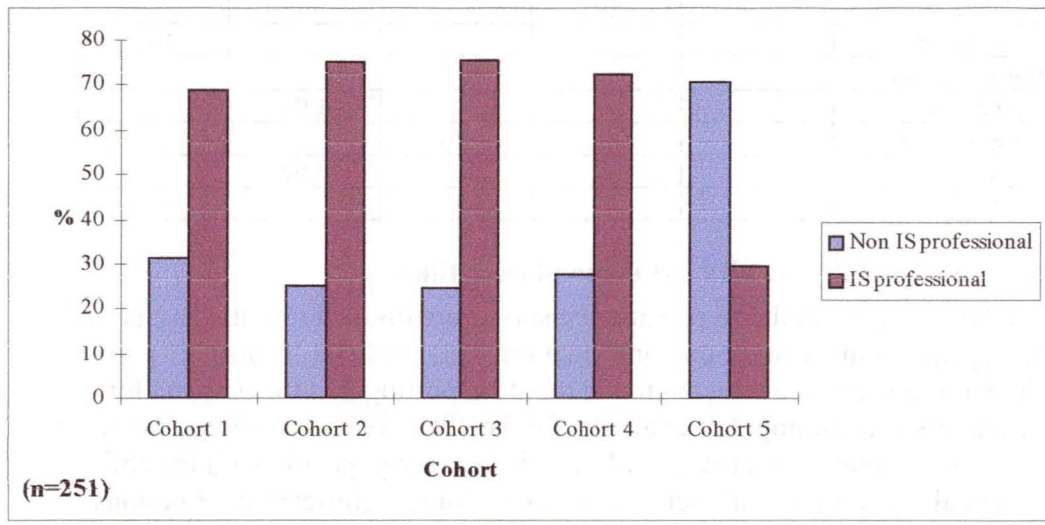


**Figure 6.13: Role focus by cohort**

### 6.6.1 Distribution of graduate initial IS role involvement

To begin the earlier results for IS role involvement, and also those for the IS recruitment survey, are again applied to enable comparisons between the five time frames. Table 6.9 provides the first of these results based on the graduate career survey. This further supports the dominance of programming as the major source of initial IS appointments, it also revealed that this is now limited to the first four graduation cohorts. In contrast, however, for Cohort 5, the most frequently reported role was that of CSO.

**Table 6.9: IS entry level roles by cohort**

| IS role | Cohort 1 | Cohort 2 | Cohort 3 | Cohort 4 | Cohort 5 |
|---|---|---|---|---|---|
| | n=11 | n=36 | n=61 | n=52 | n=10 |
| | % | % | % | % | % |
| programmer | 54.6 | 47.2 | 47 5 | 36.5 | 10 0 |
| analyst programmer | 9.1 | 11.1 | 18.0 | 11 5 | 10 0 |
| CSO | 9 1 | 5 6 | 8.2 | 15.4 | 20.0 |
| consultant | | | 8.2 | 5.8 | 10.0 |
| engineer | | 8.3 | 4.9 | 5 8 | |
| support | | 2 8 | 4 9 | 3 9 | |
| DBA | 9.1 | 5.6 | 3.3 | 1.9 | |
| teacher | | 5.6 | | 3.9 | |
| analyst | | 2 8 | | 1 9 | 10.0 |
| manager | 9.1 | | | 1.9 | 10.0 |
| trainee | | 2.8 | 1.6 | | 10.0 |
| tutor | 9.1 | | | 1.9 | |
| assistant | | 2.8 | | | |
| help desk | | | | 1.9 | |
| coordinator | | | | 1.9 | |
| lecturer | | 2.8 | | | |
| network analyst | | 2 8 | | | |
| software officer | | | | | 10.0 |
| PD research fellow | | | 1 6 | | |
| sales executive | | | | 1.92 | |
| computer scientist | | | 1.6 | | |
| technician | | | | 1.92 | |
| webmaster | | | | | 10.0 |

### 6.6.2 Entry level IS recruitment demand over time

When the results from the IS recruitment survey are divided into the five periodic sampling time frames, additional information is gleaned (see Table 6.10). In particular, there is some indication of a trend supporting that the demand for programmers is declining. For example, for the 1985, 1990 and 1995 samples, it appears that employers increasingly have tried to recruit people with the ability to work a dual analyst/programmer role. The remaining significant distributions, although there are some variations, also tend to support the extent of role involvement reported by graduates. That is, analyst, officer, engineer or consultant roles also emerge as positions more frequently reported. In addition, this aspect of the results also highlights a peak in the number of positions offered during the 1985 time frame.

**Table 6.10: Entry level IS recruitment by periodic sampling**

| | 1975 | 1980 | 1985 | 1990 | 1995 |
|---|---|---|---|---|---|
| n= | 343 | 315 | 758 | 454 | 445 |
| | % | % | % | % | % |
| programmer | 48.1 | 38.7 | 29.3 | 25.6 | 16.0 |
| analyst/prog | 21.3 | 31.1 | 34.3 | 27.3 | 27.6 |
| analyst | 19.5 | 19.1 | 10.7 | 12.3 | 11.9 |
| CSO | 3.8 | 2.5 | 10.6 | 15.9 | 12.6 |
| engineer | 2.3 | 1.9 | 3.2 | 3.5 | 8.8 |
| consultant | 1.8 | 1.3 | 1.9 | 2.4 | 3.4 |
| designer | 0.9 | 0.3 | 0.7 | 0.7 | 2.5 |
| supervisor | 0.9 | 0.3 | 0.1 | 0.7 | 0.2 |
| auditor | 0.6 | 1.3 | 2.2 | 1.8 | 0.2 |
| professional | 0.6 | 1.3 | 1.9 | 1.5 | 2.7 |
| specialist | 0.3 | | 2.0 | 2.4 | 4.0 |
| DBA | | 0.6 | 1.9 | 2.2 | 2.7 |
| instructor | | 0.3 | 0.1 | | 0.5 |
| support | | 1.3 | 1.1 | 3.5 | 6.5 |
| technologist | | | 0.3 | 0.2 | 0.5 |

### 6.6.3 Distribution of graduate initial non-IS role involvement

For those who entered their careers in other than IS positions, the distribution of their employment, over time, is presented in Table 6.11. This reveals that working as a teacher is the single common role across the cohorts. However, while it was the dominant appointment reported in the two earliest cohorts, in more recent times the extent of graduate involvement in this role has decreased. For Cohort 5, officer appointments have been the dominant area of employment. While these can be taken as indicators of public sector employment, in this portion of the results this role was indicated by these respondents as non-IS related. While there is some overlap between the positions reported from this perspective, the diversity of appointments is also wide, especially for Cohort 4.

**Table 6.11: Non -IS entry level roles by cohort**

| Non-IS roles | Cohort 1 | Cohort 2 | Cohort 3 | Cohort 4 | Cohort 5 |
|---|---|---|---|---|---|
| | n=5 | n=12 | n=20 | n=20 | n=24 |
| | % | % | % | % | % |
| teacher | 80.0 | 50.0 | 15.0 | 5.0 | 4.2 |
| officer | | | 15.0 | 5.0 | 25.0 |
| accountant | | 8.3 | 5.0 | 5.0 | 12.5 |
| manager | | | 10.0 | | 20.8 |
| engineer | | 8.3 | 20.0 | 5.0 | |
| clerk | | | 5.0 | | 8.3 |
| graduate | | | | 5.0 | |
| assessor | | 8.3 | | 5.0 | |
| auditor | | | | | 4.2 |
| PD research | 20.0 | 8.3 | | 5.0 | |
| scientist | | | 5.0 | 10.0 | |
| support | | | | 5.0 | 4.2 |
| tutor | | 8.3 | | 5.0 | |
| analyst | | | 5.0 | 10.0 | |
| actuarial trainee | | | 5.0 | | |
| administrator | | | | | 4.2 |
| chef | | | | 5.0 | |
| croupier | | | | 5.0 | |
| draftsman | | | | 5.0 | |
| enterprise facilitator | | | | | 4.2 |
| solicitor | | | 5.0 | | |
| geophysical operator | | | | | 4.2 |
| lecturer | | | | 5.0 | |
| production stager | | 8.3 | | | |
| sales | | | | | 4.2 |
| security | | | 5.0 | | |
| supervisor | | | | 5.0 | |
| surveyor | | | | 5.0 | |
| technician | | | | | 4.2 |
| tester | | | | 5.0 | |
| trainer | | | 5.0 | | |

### 6.6.4 Work history mobility

The work history mobility of these graduates, when divided according to their initial career focus, will now be examined. Following the process established in the analytic framework, the first of these results looks at the business sector, then continues to describe the data when further divided according to size of organisation.

#### *6.6.4.1 Distribution of graduate initial employment: business sector by IS, non-IS role focus*

Figure 6.14 clearly shows that, regardless of business sector, approximately two thirds of the career involvement of these graduates has been focussed in IS roles. What also needs to be taken into account is the proportional distribution, overall between business sectors. That is, just over half of the initial appointments reported by graduate have been in the public sector, followed by the private sector (34.7%) then in GBEs. Not depicted is the minimal exposure of graduates to contracting appointments which was not necessarily mutually exclusive between business sectors.

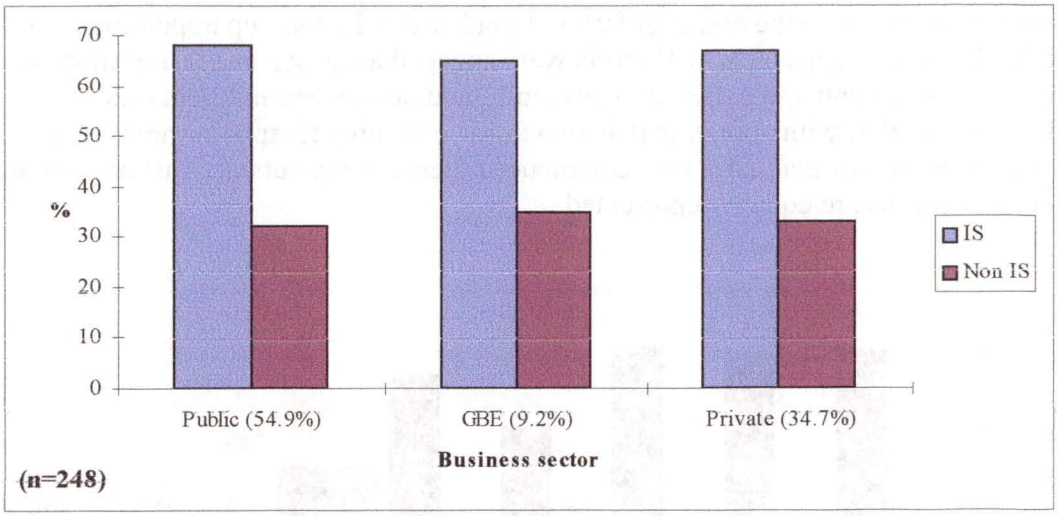


**Figure 6.14: Business sector by role focus**

### *6.6.4.2 Distribution of graduate initial employment: size of organisation by IS, non-IS role focus*

When these results are expanded to reveal a greater level of detail to consider the size of organisation with each sector (Table 6.12), then it is apparent that for both IS and non-IS appointments, large public sector organisations have been the source of around 40% of initial positions. A further similarity is between large private organisations, where approximately a further 20% of positions from either category were reported. Regardless of role focus, large GBEs have provided just under 10% of initial positions. While generally the remaining distributions decrease between large, medium and small establishments in each sector, there is one exception. That is, for those embarking on their careers in the private sector and taking up non-IS appointments. For this group small organisations have proved the second most significant source of employment in this business sector.

**Table 6.12: Business sector & organisational size by role focus**

| | IS | Non-IS |
|---|---|---|
| | (n=170) | (n=81) |
| | % | % |
| **Public** | | |
| large | 42.9 | 40.7 |
| medium | 10.0 | 12.3 |
| small | 2.4 | 1.2 |
| **GBE** | | |
| large | 8.2 | 7.4 |
| medium | .6 | 1.2 |
| small | | 1.2 |
| **Private** | | |
| large | 21.2 | 18.5 |
| medium | 6.5 | 4.9 |
| small | 6.5 | 12.3 |
| **Other** | 1.6 | |

### *6.6.4.3 Distribution of graduate initial employment: geographical location by IS, non-IS role focus*

Distinguishing initial career focus, Figure 6.15 details the geographical distribution of graduates within their initial career appointment. These results highlight that a far

greater proportion (to the extent of 80%) of graduates who took up appointments in the ACT, New South Wales or Victoria were engaged as IS personnel. For those who remained in Tasmania, the division between IS and non-IS appointments was relatively smaller, with approximately two thirds obtaining IS appointments. For the small proportion of graduates who commenced their careers outside Australia, IS and non-IS positions are equally represented.

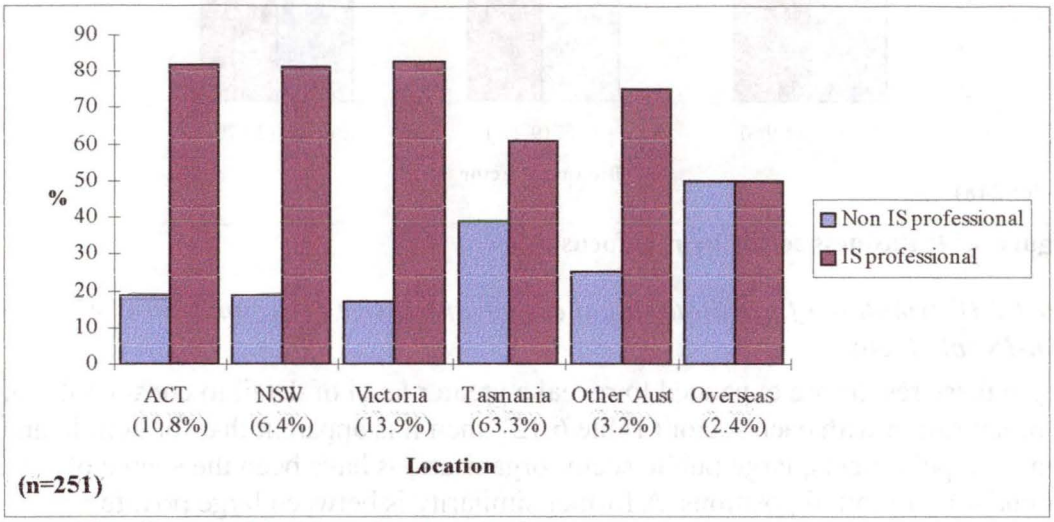


**Figure 6.15: Geographical location by role focus**

### 6.6.5 Means of finding initial appointment

In relation to means of finding initial appointments, Figure 6.16 shows whether the outcome shown earlier in Figure 6.6 changes when this data are further divided into either IS or non-IS appointments. This reveals that the search for IS appointments most frequently involved newspaper recruitment. Similarly, this career group also made greater use of the campus careers office to support obtain an appointment. They more often obtained appointments as a result of being offered positions by employer organisations or by personally contacting them to seek employment. For those establishing their working life in other than IS appointments the initial post-graduation position was more often an extension of existing work or else due to 'other' reasons. The most commonly cited explanations in this last category included the commonwealth recruitment scheme/public service test or the use of a recruitment agency. From the 'other' category less frequently used methods included newsgroups, email, social networking or assistance from University departments, notice boards or staff.

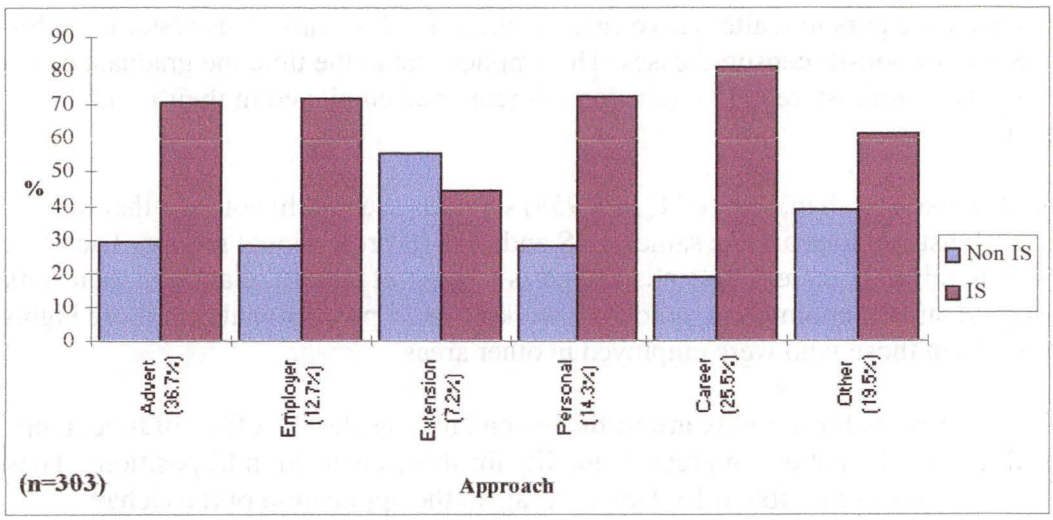


**Figure 6.16: Approaches used to obtain appointment by role focus**

### 6.6.6 Acceptance criteria

Based on either an IS or non-IS initial appointment, Figure 6.17 shows the extent to which the classified and 'other' acceptance criteria were applied by graduates embarking on their careers in each of these areas of employment focus. It is apparent that for those taking up IS positions, technology was the dominant influence to accept, whereas travel was the major consideration among those establishing a career in a non-IS capacity. For the first group secondary concerns were the offer of training, salary and job prospects. Lesser considerations were location, the organisation or ''other' reasons and the least most criterion was travel. In decreasing order, the remaining criteria for those commencing their careers in alternative areas were location, organisation, 'other', prospects, salary training and technology.

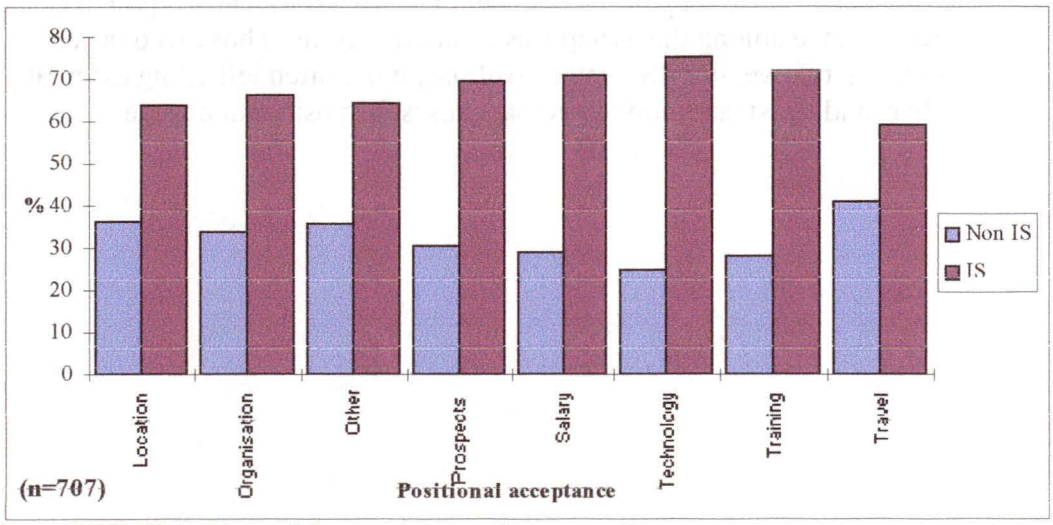


**Figure 6.17: Criteria position acceptance by career focus**

### 6.6.7 Extent of mobility in initial position

The next aspect of work history mobility considers duration for the initial career appointment and compares outcomes between IS or non-IS positions. When these data are subjected to event history analysis, then this shows that, on average, those engaged as IS professionals remained in their initial appointment for 2.2 years

whereas those pursuing alternative careers stayed for 2.7 years. This result includes 24 IS and 19 non-IS censored cases. This implies that at the time the graduate career survey was administered, 43 graduates still remained employed in their initial position.

The Wilcoxon (Gehan) test (df 1, P=.0958) supports the null hypothesis that the survival distributions are the same for IS and Non-IS professional groups. Therefore, based on this data there is no statistical basis to support that, in relation to their initial post-graduation appointment, graduates working as IS professionals are more highly mobile than those who were employed in other areas.

When the results for mobility are further extend to consider the effect of time, then this does reveal a pattern of greater mobility for those engaged in IS positions. These results are shown in Table 6.13. However, again the application of the Gehan (Wilcoxon) (Norusis 1994) test has shown that the differences in results between cohorts according to initial career focus, were not statistically significant.

**Table 6.13: Duration of initial career appointment by cohort & role focus**

| | Cohort 1 | Cohort 2 | Cohort 3 | Cohort 4 | Cohort 5 |
|---|---|---|---|---|---|
| | average survival | average survival | average survival | average survival | average survival |
| IS position | 1.9 | 2.2 | 2.5 | 2.3 | 1 5 |
| Non-IS position | 5 5 | 2.3 | 3 3 | 2.3 | 3.0 |

IS 4df p = .1936
Non-IS 4df p = .3654

### 6.6.8 Reasons for change

Finally, the reasons for leaving the first appointment are now considered on the basis of initial involvement in IS or other roles. Figure 6.18 shows that graduates embarking on their career in an IS capacity were more likely to have left this position for internal reasons, followed by 'other' reasons. The least frequently reported cause of early career change among this group was external reasons. Those who began their careers in alternative, non-IS related positions, more often left citing external reasons, 'other' and, least commonly, internal causes for positional change.

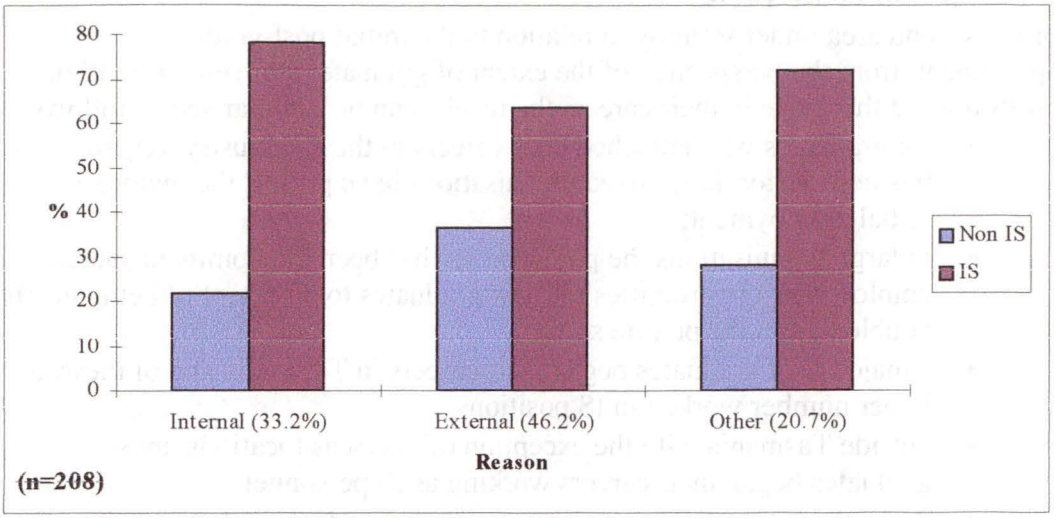


**Figure 6.18: Reasons for change by position focus**

### 6.6.9 Level 3: summary between IS and non-IS initial career focus analysis

This final summary in relation to Research Question 2 has proved results from a perspective of the initial area of career focus which distinguished between those established in an IS capacity and others which have involved employment in non-IS related roles.

#### *6.6.9.1 Initial career focus*

In relation to the extent to which graduates began their careers working in the IS industry, this portion of the results has shown that:

- graduates who gained a bachelor award based on a major in computer science have provided more likely to initiate their careers in an IS capacity;
- graduates who were awarded bachelor degrees based on a major in information systems more commonly have launched their careers working in other than IS roles;
- the most commonly reported role for those starting their careers as IS personnel has been working in a programmer position;
- Cohort 5 graduates ( implying an information systems major) when initially employed in an IS role have worked as CSOs (computer systems officers);
- the results from the IS recruitment survey have confirmed programmer positions as the dominant entry level appointment in the IS industry. However, these results have also indicated a trend for the extent of demand for programmers, post 1980, to have declined in favour of personnel capable of filling a combination of analyst/programmer roles;
- while teacher was the most frequently reported initial career appointment among those classified in the non-IS career group, over time the extent of graduate uptake of this role has declined;
- for more recent graduates as an career initiating role officer (implying government based non-IS related duties) positions have become an significant source of employment.

#### *6.6.9.2 Work history mobility*

For the second area under scrutiny in relation to the initial post-graduation appointment, from the perspective of the extent of graduate involvement in IS or non-IS roles at this stage in their careers the results can be summarised as follows:

- for graduates who launched their careers in the IS industry, regardless of business sector, large sized organisations have proved the major source of initial employment;
- in large organisations the public sector has been the dominant source of employment opportunities for new graduates to an extent of being nearly double that in the private sector;
- a majority of graduates began their careers in Tasmania and of these, a larger number worked in IS positions;
- outside Tasmania with the exception of overseas locations, most graduates began their careers working as IS personnel;
- the initial post graduation appointment for graduates whose careers were founded on non-IS positions largely represented an extension of employment with an existing employer;
- graduates who subsequently initiated IS careers applied a wider range of means of obtaining employment than those who embarked on their careers in a non-IS capacity;
- similarly, graduates who launched their careers working in the IS industry more frequently applied a wider range of criteria to decide acceptance of the position;
- the duration of the initial career appointment for graduates defined in the IS category was marginally shorter than those taking up careers in other areas;
- movement out of the initial career appointment for graduates defined in the IS positional category more often attributed to internal cause, whereas those in the non-IS positional classification tended to change for external reasons.

## 6.7 Summary

Based on the application of the analytic framework purposefully constructed to guide the presentation of the results for the second research question three levels of analysis were conducted:

- Level 1 - overview;
- Level 2 - between graduation cohorts;
- Level 3 - IS, non-IS role involvement.

Research Question Two encompassed a total of six aspects to examine the initial career experience of graduates.

*With reference to the initial post-graduation appointment and with a particular focus on original career choice, business sector and geographic location, how did graduates approach gaining and accepting the position and what is the extent of their mobility when engaged in this role?*

The extent to which graduates embarked on their careers working in an IS capacity represents an important source of feedback in relation to the industry shortage of skilled IS personnel. For example, these results establish a benchmark to gauge subsequent movement out of the IS industry. Should this prove to be abnormally high then these results could indicate a need for action to improve the retention rate of those initiating careers as IS personnel.

The result obtained in relation to the uptake of IS careers by graduates has proved positive by establishing that nearly two thirds of graduates with the tertiary qualifications to enable them to work professionally in the IS field, have done so. These results have also shown that a range of bachelor qualifications have been involved and that proportionally more male than female graduates have embarked on their careers in the IS industry. Level 3 provided a further insight by establishing the link between computer science major graduates and initial IS career appointments. For graduates from this undergraduate major, programmer has been the dominant entry level positional role. The results have also revealed that a larger proportion of graduates from an information systems major background initiated their careers in other than IS roles. Graduates from this background who entered the IS industry more commonly have worked as CSOs (computer systems officers).

While teaching appointments were the most significant source of employment among graduates defined in the non-IS positional category, this role has declined in frequency to be supplanted by officer (implying non IS positions in government) appointments.

The objective of the second area under scrutiny in Research Question 2 was to examine a further problematic characteristic of the IS industry, above average employee mobility as compared with other, non-IS, labour force sectors.

The first aspect of work history mobility has shown that large sized organisations have been the dominant source of career opportunities for graduates when embarking on their careers. Extending this result has revealed that large public sector organisations have provided jobs to an extent nearly double those available in the private sector. In addition, there was a link between computer science majors, initial positions in IS and employment in large public organisations. A further association was shown between information systems majors, IS roles and large private organisations.

Consistently Tasmania was the dominant location for graduates to initiate their careers. While Victoria, the ACT or New South Wales have been the main alternative areas for immediate post graduation employment, over time the ACT has declined as a popular destination for graduates to establish a career.

Based on this graduate sample, the results have not supported that graduates who initially worked in the IS industry have proved more highly mobile than those embarking on their careers in other areas. While those starting their careers in a IS capacity remained in the position for a shorter time, the difference was only marginal and was shown to not be statistically significant. When the reasons reported for positional change were also taken into account, then this showed that while more generally movement was attributed to 'external' cause, at a lower level of detail the

majority of change for those engaged as IS personnel was driven by internal career movement.

The means graduates have used to gain the initial career employment and the criteria they have applied when deciding to accept a particular position have offered some informative results in relation to Research Question 2. This portion of the results revealed that over time graduates have increasingly utilised a wider range of approaches to gain employment and also in the criteria used to guide their acceptance choice. In particular this result was true for those initiating IS careers. More generally, advertisements have emerged as the most popular source of finding work, a finding that goes against the uptake of careers in Tasmania and the number of IS positions offered through local recruitment advertised in the local newspaper, *The Mercury*. Overall considerable agreement has been demonstrated that job prospects have been a key factor guiding positional acceptance.

In Chapter Eight, the results for the two research questions posed in this thesis are again revisited. The aim of this chapter will be to report the extent of differences between the results obtained from the different perspectives established within the two analytic frameworks that have been applied in reporting these results.

# CHAPTER SEVEN: comparative analysis of results

## 7.1 Introduction

This chapter draws together the results from the levels of analysis presented in the previous two chapters. The aim is two-fold. Firstly, to provide a comparative summary of the results for each of the two research questions posed in this thesis. Secondly, to filter the results so as to provide a basis for the discussion and conclusions to follow in the final chapter.

To support the comparisons the proportional percentages of the results for the various levels of analysis presented in Chapter Five and Chapter Six have been normalised using the formula provided in Appendix 8. The objective of this approach is to readily demonstrate the differences in the extent of the distribution of results within the various levels of analysis presented.

The presentation of these results will again follow the common themes that reflect the issues raised in each research question. For the purposes of comparison, however, the results for each particular aspect will be combined into a single table. Depending on which of these is under examination, this could involve simply a two-way comparison or, where appropriate, include further additional levels of the results. In keeping with the earlier presentation of results, where applicable results from the IS recruitment survey will also be included.

## 7.2 Research Question 1

*With a particular focus on career and work history mobility, what are the career experiences of graduates from the Department of Computer Science at the University of Tasmania who gained a bachelor degree based on a major in either computer science or information systems?*

To begin, the demographic results used previously to initiate the response for the first research question are drawn together to provide a graphical summary (Figure 7.1). The aim is to re-establish the extent of career involvement in each of the three career streams as defined in this research, based on a profile of the gender and bachelor qualifications of respondent graduates. In relation to bachelor degree it should be noted that, due to the low numbers of graduates who gained awards in computing, education and a combined science/law degree, again these have been purposefully excluded in this figure.

The division by gender indicates that less than one quarter of respondents were women graduates. This result is in keeping with the fact that women are generally under represented in computer science courses (Compeau, Higgins & Huff 1998); (McLean, Tanner & Smits 1991) and the IS industry in general (Igbaria & Baroudi 1995).

The next aspect, bachelor degree, follows through on the initial gender outcome to show the distribution across the six major degrees represented in the sample. It also indicates that, within this sample, the work histories of graduates from Bachelor of

Engineering and Bachelor of Surveying backgrounds have been limited to male graduates.

For the third perspective in this summary, career stream, colour legends have been applied to link academic background and involvement in one of the potential three career streams as defined within this research. The olive green solid line indicates distributions to dedicated IS careers, the dashed blue line shows the link between bachelor degree and non-IS related careers. The solid orange line indicates the association between tertiary award and involvement in hybrid careers. This figure highlights the considerable association between Bachelor of Science degrees, for both male and female graduates and dedicated IS careers.

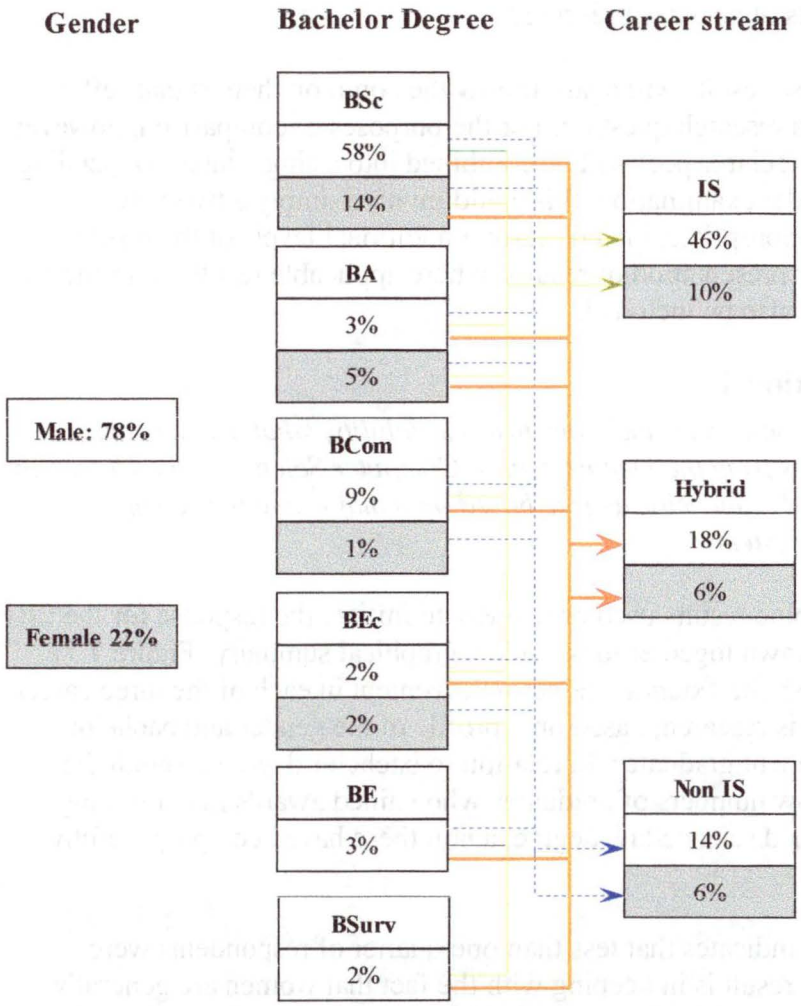


**Figure 7.1: Graduates by gender, degree & career stream**

### 7.2.1 IS career stream

The first of these results presents a comparison of the outcome in relation to the career focus within the IS career stream. As shown in Table 7.1, this combines two perspectives of the earlier results: the overall view and also the outcome when the data were further differentiated into graduation cohorts.

From an overview perspective, the normalisation of results serves to reinforce the considerable career involvement of these graduates in either systems development or management careers. The large gap between the distribution of rankings with these and the remaining areas of IS careers provides ample evidence to support this outcome.

When these two dominant areas of IS career focus are compared with the cohort results, then there is some indication of a move away from systems development oriented careers towards management focussed careers. However, this result needs to be viewed with some caution. Bearing in mind that the work histories of the earliest graduates cover a much longer period than that for more recent graduates, it is apparent that other factors have influenced this result. This outcome will be pursued shortly when the organisational involvement of graduates are introduced in a comparative representation of the results for the first research question.

An examination of the remaining results reveals while overall there has been a large diversity of careers, the cohort divisions serve to identify some patterns. In particular, for Cohort 1, Cohort 2 and Cohort 5 the areas of career focus appear to have been more tightly clustered when considered against the outcomes for Cohort 3 and Cohort 4. For these two groups a wider range of career areas have emerged. This perspective of the results also serves to indicate that systems development and management careers, to date, appear to have been key areas of focus in the careers of Cohort 5 graduates.

**Table 7.1: IS career focus comparisons**

| Career focus | Overall | Differentiated by graduation cohort | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| | (n=144) rank | (n=8) rank | (n=27) rank | (n=50) rank | (n=49) rank | (n=10) rank |
| systems development | 1.0 | 1.0 | 1.0 | 1.0 | 3.9 | 1.0 |
| management | 3.5 | 1.0 | 4.7 | 3.4 | 1.0 | 1.0 |
| CSO | 10.6 | 6.0 | 7.7 | 9.8 | 3.9 | 6.0 |
| programming | 11.4 | 6.0 | 6.9 | 10.6 | 5.3 | |
| consultant | 12.5 | | | 10.6 | 11.0 | 6.0 |
| network | 12.5 | | 6.2 | 10.6 | 11.0 | 6.0 |
| support | 14.0 | | | 11.4 | 8.1 | |
| academic | 14.4 | | 7.7 | 11.4 | 9.6 | |
| analyst/programming | 14.4 | | | 11.4 | 11.0 | |
| database | 14.9 | 6.0 | 6.9 | | 11.0 | |
| software engineering | 14.9 | 6.0 | 6.9 | 12.2 | | |
| technical | 15.2 | | 7.7 | | 11.0 | |
| graphical IS | 15.6 | | | | 11.0 | |
| internet | 16.1 | | | | | 6.0 |
| marketing | 16.1 | | | | 12.5 | |

*7.2.1.1 IS role involvement*

The next dimension for comparison focusses on the extent of the distribution of IS roles, both representative of the work histories of graduates defined in the IS or hybrid career stream results, and also the labour market demand based on the results from the IS recruitment survey (Table 7.2). This is based on the overall results and then those to represent a regional perspective of IS recruitment. Four levels of results from the graduate career survey have also been included. These represent the overall

results, career streams and then the outcomes when further differentiated to show the cohort distributions within the IS or hybrid career streams.

The application of a normalised ranking of these results reinforces that programmer appointments, both from an industry demand perspective and also for the computer science major graduates, have been the key IS positional role. However, it also demonstrates that the extent of this dominance has varied in some aspects of the results. In particular, programmer positions have been less markedly higher than analyst/programmer appointments offered in *The Australian* and *The Age* recruitment samplings. While only very slightly, from the national perspective it is evident that employers have tended to prefer people capable of filling the multiple analyst/programmer role. This outcome has also largely proved the case in the career experiences reported by those making up Cohort 3 and classified in the dedicated IS career stream, even though for this group programmer positions, albeit very slightly, have proved dominant.

While the results from *The Mercury* support that programmers have proved the most highly sought IS position in Tasmania, an equal proportion of CSOs have been recruited. Contra to the common pattern in relation to programming appointments, in the two most recent cohorts based on computer science majors, a trend has emerged for graduates to more often have been employed as managers.

The limited exposure to programming in the information systems curriculum has already been noted as the reason for the minimal employment involvement of this graduate group in that role. Graduates from this background, and reporting dedicated IS careers, have more often worked as analyst/programmers, managers, analysts or CSOs. The central role of those in the hybrid career stream has been that of analyst.

Beyond the IS positional roles already described above, the remaining roles have proved highly diverse. This is especially true when the overall distribution of graduate IS role involvement is considered. At finer levels of detail this IS role disparity is shown to have been more evident in the IS career stream, in particular among graduates making up Cohort 2, Cohort 3 and, to a lesser extent, Cohort 4.

**Table 7.2: IS positional involvement comparisons**

| | IS recruitment survey | | | | Graduate career survey | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Overall | *The Aust'n* | *The Age* | *The Mercury* | Overall | Career stream | | Information systems career stream by cohort | | | | | Hybrid career stream by cohort | | | | |
| | | | | | | IS | Hy | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| n= | 2891 | 2132 | 691 | 68 | 702 | 556 | 146 | 52 | 145 | 212 | 126 | 21 | 15 | 56 | 46 | 22 | 7 |
| | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank |
| programmer | 1.0 | 1.2 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 9.6 | 1.0 | 1.0 | 4.9 | 3.3 | |
| analyst/programmer | 4.0 | 1.0 | 2.0 | 6.9 | 8.8 | 4.6 | 9.8 | 5.8 | 3.9 | 1.3 | 10.1 | 1.0 | 3.3 | 8.9 | 7.5 | 10.1 | 5.4 |
| manager | 11.5 | 11.7 | 10.6 | 8.6 | 13.2 | 9.1 | 5.4 | 3.9 | 4.4 | 11.7 | 9.6 | 1.0 | | 4.6 | 1.0 | 1.0 | |
| analyst | 12.0 | 12.1 | 10.9 | 9.8 | 22.3 | 16.8 | 12.6 | 12.6 | 11.6 | 13.7 | | 1.0 | 4.0 | 11.7 | 11.4 | 10.1 | 1.0 |
| CSO | 14.5 | 15.2 | 13.6 | 1.0 | 19.6 | 12.8 | 12.2 | 7.6 | 14.0 | 13.4 | 9.6 | 1.0 | | 11.0 | 7.5 | 10.1 | 5.4 |
| engineer | 18.4 | 18.6 | 17.5 | 11.0 | 21.4 | 14.1 | 11.4 | 10.6 | 10.7 | 14.0 | 14.3 | | 4.0 | 10.3 | 6.2 | 10.1 | |
| administrator | 19.0 | 19.2 | 17.9 | 11.6 | 26.1 | 14.6 | 15.0 | 12.6 | | 16.3 | 13.8 | 9.6 | | | | 10.1 | 5.4 |
| leader | 19.3 | 19.2 | 18.6 | | 24.8 | 16.1 | 12.2 | | 13.6 | 15.7 | 10.1 | | | 10.3 | 6.2 | 10.1 | |
| support | 19.5 | 20.2 | 16.5 | | 22.0 | 14.3 | 13.4 | | 15.0 | 14.3 | 9.1 | 9.6 | | 11.7 | 10.1 | | 5.4 |
| consultant | 19.7 | 19.6 | 19.4 | 11.0 | 20.7 | 12.7 | 13.8 | 11.7 | 14.0 | 11.4 | 14.3 | 5.3 | | 12.4 | 12.8 | 10.1 | 5.4 |
| specialist | 19.8 | 19.7 | 19.7 | | 26.5 | 16.8 | | 12.6 | 14.5 | 16.3 | | | | | | | |
| professional | 19.9 | 20.1 | 19.1 | 10.4 | | 14.6 | | | | | 13.8 | | | | | | |
| DBA | 20.1 | 20.0 | 19.7 | | 24.7 | 15.4 | | 9.7 | 13.6 | | | | | | | | |
| auditor | 20.3 | 20.3 | 19.5 | | 27.3 | | 15.4 | | | | | | | | 11.4 | | |
| designer | 20.4 | 20.4 | 19.8 | | 22.0 | 14.3 | | | | | 13.4 | | | | | | |
| coordinator | 20.5 | 20.3 | 20.8 | | 25.9 | 16.6 | 15.0 | | 15.5 | | 14.3 | | | 12.4 | | 10.1 | |
| academic | 20.6 | 20.4 | | | 25.9 | 16.5 | 15.8 | 12.6 | 14.0 | 16.5 | 14.3 | | | | | 10.1 | |
| director | 20.6 | 20.5 | 20.4 | 11.6 | 26.4 | 17.0 | 15.4 | 11.7 | | 11.4 | | | | 12.4 | 12.8 | | |
| supervisor | 20.8 | 20.9 | 20.0 | 11.6 | 27.2 | 17.4 | | 12.6 | | | | | | | | | |
| technologist | 21.0 | 21.0 | 20.5 | | | | | | | | | | | | | | |
| other | 21.1 | | 20.6 | | 26.4 | 16.8 | | | | | | | | | | | |
| architect | | | | | 27.2 | 16.6 | | | 15.5 | | | | | | | | |
| communicator | | | | | 27.5 | 16.8 | | | 16.0 | | | | | | | | |
| graduate trainee | | | | | 26.5 | 16.8 | | | 16.0 | 16.0 | | 1.0 | | | | | |
| license management service | | | | | 27.5 | 14.3 | | | | 14.3 | 15.3 | | | | | | |
| scientist | | | | | 27.3 | 16.5 | | | | 16.5 | | | | | | | |
| systems strategist | | | | | 27.5 | | 15.4 | | | | | | | 11.0 | | | |
| technical document writer | | | | | 27.5 | | 15.8 | | | | | | | | 10.1 | | |
| webmaster | | | | | 27.5 | 17.4 | | | | | | 9.6 | | | | | |

### 7.2.2 Hybrid career stream

To follow on from the comparisons of IS positional involvement of graduates making up the hybrid career stream, their non-IS appointments will be compared.

As Table 7.3 shows, at an overview level, the normalisation of the earlier results highlights the considerable gap from this perspective between 'other' roles and the next most frequently reported, teaching positions. This not only supports the large diversity of non-IS areas where graduates have worked, but also the notion of 'stop gap' and 'time out' positions which will be considered further in the closing chapter.

When this result is extended to also compare these results over time, it shows that the considerable involvement of graduates from the first two cohorts in teaching appointments. For the computer science major stream, regardless of cohort, the remainder of non-IS roles reported have be widely distributed.

For Cohort 5, the information systems undergraduate group, non-IS roles have largely represented appointments defined as 'other' or else officer and, to a lesser extent manager positions.

**Table 7.3: Hybrid career stream non-IS positional involvement comparisons**

| | Overall | Hybrid career stream by cohort | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| n= | 142 | 18 | 43 | 48 | 20 | 13 |
| | rank | rank | rank | rank | rank | rank |
| other | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| teacher | 8.9 | 2.7 | 1.9 | 8.5 | 7.0 | 4.1 |
| officer | 10.6 | 7.7 | 5.8 | 8.5 | | 1.8 |
| manager | 12.0 | 4.3 | 9.4 | 8.9 | | 3.3 |
| lecturer | 12.8 | 6.0 | | 9.3 | 5.5 | |
| director | 13.4 | 6.0 | 7.5 | | | |
| surveyor | 13.4 | 7.7 | 10.3 | 9.7 | 7.0 | |
| accountant | 13.7 | | 9.4 | 10.2 | 8.5 | 4.1 |
| tutor | 13.7 | | | | 7.0 | |
| consultant | 14.0 | | 10.3 | 10.2 | 7.0 | |
| assessor | 14.2 | | 10.3 | | 7.0 | |
| engineer | 14.2 | | | 9.3 | | |
| graduate research assistant | 14.2 | | 9.4 | 10.2 | | |

### 7.2.3 Non-IS career focus

The final section in relation to the career activities of graduates provides a comparative summary of the career focus for those who have followed alternative, non-IS related careers (refer to Table 7.4).

This shows that, for graduates from a computer science background, both overall and over time, academic careers have been the dominant career choice. For the purposes of this research this involves teaching both in the education system and also tertiary institutions. While this career course has been central to the working life of graduates in Cohort 1 and, dominant in Cohort 2, in the two most recent cohorts a wider range of careers are represented. In particular, for Cohort 3 graduates careers in finance

have become more prevalent and, for Cohort 4, engineering has emerged as a secondary area of employment.

The major career involvement of information systems graduates has been in accounting. Largely the results for this group reflect the association between the primary bachelor degree and career choice. That is, within the period included in this study, information systems was not offered by the University of Tasmania as a degree in its own right. Graduates completing degrees in a number of areas were able to incorporate this undergraduate stream as an elective major. For example, a degree in either commerce or economics could have been based on a major from the primary area and an information systems major. The relatively high ranking of the 'other' category for Cohort 5 can be taken as indicative that information systems graduates, in particular those from an Arts background, potentially could have been in the process of establishing viable career options.

**Table 7.4: Non-IS career focus comparisons**

| Career focus | Overall | Non-IS career stream by cohort | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| n= | 52 | 4 | 3 | 13 | 13 | 19 |
| | rank | rank | rank | rank | rank | rank |
| academic | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 5.2 |
| accounting | 7.9 | | | 7.9 | | 1.0 |
| other | 7.9 | | | 7.9 | 5.6 | 2.1 |
| engineering | 9.1 | | | 5.6 | 4.2 | |
| finance | 9.1 | | | 3.3 | 5.6 | 6.3 |
| marketing | 9.1 | | | | | 5.2 |
| officer | 9.1 | | | | | 5.2 |
| insurance | 10.8 | | | 7.9 | | |
| law | 10.8 | | | 7.9 | | |
| manufacturing | 10.8 | | 2.0 | | | |
| psychology | 11.4 | | | | 5.6 | |
| welfare | 11.4 | | | | | 6.3 |

### 7.2.4 Work history mobility

In this section, the comparative summary results draw on the four themes of mobility as encompassed in the first research question. To recap, these are career mobility in relation to organisation, geographical location, duration within positions making up the work histories and reasons for positional change.

#### *7.2.4.1 Comparison distribution of graduate employment by business sector*

Table 7.5 provides the first of these results and shows the distribution of employment within the three main business sectors. It contains the four level of detail for this portion of the results from the graduate career survey. The 'other' category implies contract appointment based on simultaneous employment across different business sectors and sized organisations.

What this view of the result highlights is that overall, the extent of positional involvement has been almost equally divided between the public and private sectors.

While the close balance of work involvement between the two major business sectors persists regardless of career stream, from a time perspective a clear pattern emerges. That is, Cohort 3 and Cohort 5 stand apart as having consistently more often been

employed in the private sector. This outcome is true regardless of whether the career has been in the information systems, hybrid or non-IS career streams.

The comparative perspective of the results also demonstrates the changing levels of graduate career involvement in GBEs. There are examples of closer distributions of employment between the three business sectors in all three career streams. For those following dedicated IS careers, this is evident in both Cohort 1 and Cohort 2. In the hybrid career stream this more even distribution is true for Cohort 2 and, similarly in the non-IS career stream for Cohort 3.

**Table 7.5: Business sector employment mobility comparisons**

| Business sector | Overall | Differentiated by graduation cohort | | | | | Career stream | | | Information systems career stream by cohort | | | | | Hybrid career stream by cohort | | | | | Non-IS career stream by cohort | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | IS | Hyb | Non | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| n= | 978 | 103 | 260 | 336 | 194 | 85 | 556 | 288 | 128 | 52 | 145 | 212 | 126 | 21 | 33 | 99 | 94 | 42 | 20 | 17 | 14 | 30 | 27 | 40 |
| | | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank |
| Public | 1.3 | 1.0 | 1.0 | 3.3 | 1.0 | 3.8 | 1.0 | 1.2 | 1.2 | 1.0 | 1.0 | 2.8 | 1.0 | 2.4 | 2.1 | 1.0 | 2.5 | 1.6 | 1.0 | 1.0 | 2.0 | 1.7 | 1.0 | 2.6 |
| GBE | 5.1 | 3.1 | 3.1 | 5.7 | 5.4 | 5.9 | 3.7 | 3.3 | 3.1 | 3.2 | 2.8 | 5.7 | 5.5 | 4.3 | | 2.8 | 3.0 | | 3.0 | | | 2.8 | 3.0 | 3.2 |
| Private | 1.0 | 1.5 | 1.5 | 1.0 | 1.3 | 1.0 | 1.0 | 1.0 | 1.0 | 1.8 | 1.8 | 1.0 | 1.3 | 1.0 | 1.0 | 2.0 | 1.0 | 1.0 | 1.0 | 1.9 | 1.0 | 1.0 | 2.3 | 1.0 |
| Other | 5.7 | | | 6.5 | 5.8 | 6.8 | 4.1 | 3.8 | | | | 6.2 | 5.8 | 5.3 | | | | 3.6 | | | | | | |

### *7.2.4.2 Comparison distribution of graduate employment by size of organisation*

At a finer level of detail, when the size of organisation is also taken into consideration and compared, then while some of the patterns of graduate employment identified in the previous results remain, some outcomes change.

As Table 7.6 shows, the presentation of these results repeats the four levels of detail and now also incorporates the rankings for the distribution of graduate career involvement between large, medium and small business organisations.

What this perspective of the results highlights is the overall, clear distinction of graduate career involvement between the large public and private organisations. This is evidenced by the size of the gap in the ranking between these two institutions.

Compared from a broad cohort perspective, the previous results for business sector again hold true, and large organisations emerge as the key employers in both the public and private sectors. What this does indicate though, is that for Cohort 1, Cohort 2 and Cohort 4, the extent of their involvement in large public sector organisations is more clearly distinguished from that in large private organisations. For Cohort 3 and Cohort 5, while large private organisations have remained central to their careers, the distribution of their employment between these, and large public sector organisations is much less marked. This is evidenced by the small 'gap' in the rankings for these two cohorts.

The inclusion of this added level of detail now determines that regardless of career stream, large public sector organisations are shown to have been the major sources of career opportunities for these graduates. The distribution of career activity for those following an IS career, however, is shown as more closely divided between large public and private sector organisations. While the distinction has been more marked for the hybrid and non-IS career stream graduates, what this does indicate is the beginning of a trend for less sizable private organisations to have been more prominent as employers for these career groups.

When the career stream results are further divided into graduation cohorts, then the trend towards an increase in career involvement in smaller, private sector companies is shown to have largely occurred in the hybrid career stream. In particular, this relates to Cohort 1, Cohort 3 and Cohort 4. Both medium and large private sector organisations have been central to Cohort 1 graduates following this career stream. Similarly, Cohort 3 graduates have quite clearly divided the majority of their career activity between small and large private business establishments. While large public organisations have provided the larger proportion of positions held by Cohort 4 graduates, small private organisations have also emerged as prominent sources of employment.

The importance of small private sector businesses to those pursuing non-IS careers also becomes evident in these comparisons. The career involvement of these graduates has been largely distributed between small or large private sector organisations.

**Table 7.6: Employment by business sector & organisational size**

| | Overall | Differentiated by graduation cohort | | | | | Career stream | | | Information systems career stream by cohort | | | | | Hybrid career stream by cohort | | | | | Non-IS career stream by cohort | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | IS | Hyb | Non | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| n= | 978 | 103 | 260 | 336 | 194 | 85 | 556 | 288 | 128 | 52 | 245 | 212 | 126 | 21 | 33 | 99 | 94 | 42 | 20 | 17 | 14 | 30 | 27 | 40 |
| | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank |
| **Public** | | | | | | | | | | | | | | | | | | | | | | | | |
| large | 1.0 | 1.0 | 1.0 | 1.9 | 1.0 | 2.1 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.6 | 1.0 | 2.9 | 2.2 | 1.0 | 4.5 | 1.0 | 1.0 | 1.9 | 1.0 | 1.0 | 1.0 | 4.0 |
| medium | 9.2 | 6.2 | 7.8 | 7.8 | 7.7 | 8.8 | 6.9 | 9.2 | 4.4 | 4.7 | 6.7 | 7.0 | 7.0 | 5.8 | 6.3 | 6.7 | 5.6 | 5.7 | | 1.0 | 5.0 | 4.0 | 6.3 | 7.0 |
| small | 11.4 | 8.6 | 9.8 | 9.6 | 8.9 | 9.5 | 8.2 | 11.0 | 6.9 | | 8.7 | 7.8 | 8.5 | | 5.7 | 7.8 | 7.2 | | | | | | | 7.0 |
| **GBE** | | | | | | | | | | | | | | | | | | | | | | | | |
| large | 9.9 | 8.6 | 9.2 | 6.9 | 8.3 | 8.1 | 7.2 | 9.7 | 6.0 | 4.8 | 7.8 | 6.4 | 8.1 | 4.8 | | 7.7 | 4.7 | | 5.3 | | | 5.0 | 5.1 | 7.0 |
| medium | 11.5 | | 9.8 | 9.6 | 9.0 | 8.8 | 8.3 | 11.1 | 6.8 | | 8.9 | | 8.6 | | | 7.8 | | | 5.3 | | | | | |
| small | 11.7 | | 10.0 | | | | 8.4 | 10.6 | | | 9.0 | | | | | | | | | | | 7.0 | | |
| **Private** | | | | | | | | | | | | | | | | | | | | | | | | |
| large | 4.4 | 3.7 | 5.3 | 1.0 | 6.5 | 1.0 | 2.8 | 6.3 | 3.5 | 2.4 | 3.3 | 1.0 | 6.2 | 1.0 | 1.6 | 6.0 | 3.4 | 4.0 | 2.1 | | 1.0 | 2.0 | 5.9 | 2.5 |
| medium | 8.9 | 7.0 | 9.1 | 6.5 | 6.6 | 6.3 | 6.7 | 8.1 | 4.6 | | 8.6 | 5.8 | 6.1 | 5.8 | 1.0 | 7.1 | 5.2 | 5.0 | 5.9 | | 4.0 | 4.0 | 5.5 | 4.0 |
| small | 7.6 | 7.6 | 8.7 | 4.5 | 5.0 | 4.5 | 6.6 | 5.4 | 3.5 | 4.8 | 8.3 | 6.0 | 4.8 | 6.7 | 4.5 | 6.5 | 1.0 | 2.3 | 5.9 | 3.1 | 5.0 | 3.0 | 5.5 | 1.0 |
| **Other** | 11.4 | | | 9.4 | 8.9 | 9.5 | 8.3 | 11.3 | | | | 7.5 | 8.6 | 6.7 | | | | 6.0 | | | | | | |

### *7.2.4.3 Comparison distribution of graduate employment by geographical location*

The comparative view of the geographical distribution of graduate employment offers some insight into the patterns of travel during the course of their careers. As Table 7.7 shows, once again four perspectives of normalised results are examined.

Overall, as evidenced by the very large gap between Tasmania and the other geographical destination graduates reported working, this state has clearly been the major location during their careers.

Presented in this format serves to highlight the diversity of geographical locations, which, on a closer examination are largely reflective of the travel patterns of Cohort 3, especially for those reporting hybrid, and to a lesser extent, IS careers.

For the information systems major graduates (implying Cohort 5), the normalised results reveal that while a majority have remained in Tasmania, the distribution between the other destinations where they have worked has been more evenly balanced. This was particularly evident for those pursuing IS careers and, although less often, graduates classified in the hybrid career stream.

**Table 7.7: Geographical employment mobility comparisons**

| | Overall | Differentiated by graduation cohort | | | | | Career stream | | | Information systems career stream by cohort | | | | | Hybrid career stream by cohort | | | | | Non-IS career stream by cohort | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | IS | Hyb | Non | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| n= | 976* | 103 | 258* | 336 | 194 | 85 | 556 | 286 | 128 | 52 | 145 | 212 | 126 | 21 | 33 | 97* | 94 | 42 | 20 | 17 | 14 | 30 | 27 | 40 |
| | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank |
| Tasmania | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 2.2 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Victoria | 23.7 | 10.5 | 8.7 | 19.6 | 19.6 | 5.5 | 11.5 | 21.9 | 11.2 | 6.9 | 7.0 | 5.0 | 6.3 | 2.9 | | 6.6 | 21.4 | 5.9 | 3.7 | | 3.3 | 2.8 | 4.6 | 5.4 |
| New South Wales | 24.9 | 9.5 | 10.5 | 21.4 | 21.4 | 5.0 | 13.9 | 23.0 | 13.1 | 6.4 | 10.8 | 4.8 | 5.8 | 2.0 | 4.3 | 6.9 | 20.8 | | 4.0 | | | 5.2 | | 5.0 |
| ACT | 25.1 | 7.4 | 7.6 | 30.7 | 30.7 | 6.2 | 12.1 | 23.8 | 12.8 | 3.2 | 3.5 | 10.1 | 6.4 | | | 6.7 | 24.7 | 7.0 | | 1.8 | | 4.3 | | 5.8 |
| UK | 27.6 | 5.8 | 10.5 | 33.3 | 13.2 | 6.0 | 15.7 | 22.0 | 13.8 | 5.0 | 10.8 | 11.2 | 6.7 | | 1.0 | 7.1 | 24.1 | 6.8 | 4.0 | | | | | 5.6 |
| Queensland | 29.8 | 10.5 | 10.9 | 33.0 | 13.8 | | 16.8 | 24.4 | 13.9 | | 10.8 | | | | 4.8 | | 23.6 | 7.0 | | | | | 5.2 | |
| South Australia | 30.4 | | 11.2 | 34.5 | 13.6 | | 17.3 | 25.0 | 13.9 | | 11.6 | 12.0 | 7.1 | | | | 24.7 | 6.8 | | | | | 5.2 | |
| USA | 30.4 | 10.5 | 10.8 | 36.5 | 13.7 | | 17.3 | 25.0 | | | 10.3 | | 2.4 | | 4.8 | | 24.1 | | | | | | | |
| Australia wide | 30.5 | 10.5 | | 35.3 | | 5.9 | 17.3 | | 13.4 | 6.9 | 12.3 | 12.3 | | | | | | | | | | | | 5.0 |
| New Zealand | 30.7 | | 11.0 | 36.5 | | | 17.5 | | 13.8 | | | 12.9 | | | | | | | | | 3.3 | | | |
| Japan | 30.9 | | | 35.6 | | | 17.8 | 24.7 | | | | | | | | | 22.5 | | | | | | | |
| Canada | 31.0 | | 11.1 | 36.8 | | | | 25.2 | | | 11.4 | | | | | | 24.7 | | | | | | | |
| Switzerland | 31.0 | | | 36.2 | | | | 25.0 | | | | | | | | | 23.6 | | | | | | | |
| Northern Territory | 31.1 | | | | 13.9 | | | 25.1 | | | | | | | | | | 7.0 | | | | | | |
| Western Australia | 31.1 | | 11.2 | 36.8 | | | 17.9 | 25.2 | | | | 13.1 | | | | | | | | | | | | |
| Germany | 31.1 | | | 36.8 | 13.9 | | 17.9 | 25.2 | | | | | 7.1 | | | | 24.7 | | | | | | | |
| Hong Kong | 31.1 | | | 36.5 | | | | 25.2 | | | | | | | | | 24.1 | | | | | | | |
| Indonesia | 31.1 | | | 36.5 | | | 17.9 | 25.2 | | | | 13.1 | | | | | 24.7 | | | | | | | |
| Singapore | 31.1 | 10.5 | | 36.8 | | | 17.8 | | | 6.9 | | 13.1 | | | | | | | | | | | | |
| Antarctica | 31.1 | | | 36.8 | | | | 25.2 | | | | 13.1 | | | | | 24.7 | | | | | | | |
| Asia | 31.1 | | 11.2 | | | | | 25.2 | | | | | | | | | | | | | | | | |
| Belgium | 31.1 | | | 36.8 | | | | 25.2 | | | | | | | | | 24.7 | | | | | | | |
| Fiji | 31.1 | | | 36.8 | | | | 25.2 | | | | | | | | | 24.7 | | | | | | | |
| France | 31.1 | | | 36.8 | | | | 25.2 | | | | | | | | | 24.7 | | | | | | | |
| Malaysia | 31.1 | | | 36.8 | | | 17.9 | | | | | 13.1 | | | | | | | | | | | | |
| Netherlands | 31.1 | | | 36.8 | | | 17.9 | | | | | | | | | | | | | | | 5.2 | | |
| Philippines | 31.1 | | | 36.8 | | | 17.9 | | | | | 13.1 | | | | | | | | | | | | |
| Sweden | 31.1 | | | | 13.9 | | | | 13.9 | | | | | | | | | | | | | | 5.2 | |
| Thailand | 31.1 | | | 36.8 | | | | 25.2 | | | | | | | | | 24.7 | | | | | | | |

*adjusted to reflect 2 cases of missing data

#### *7.2.4.4 Comparison of positional mobility*

The third area of the comparisons of work history mobility focuses on positional mobility. In light of the literature, and the perception of the above average positional mobility of IS personnel (Bartol 1983), these results provide an opportunity consider the outcomes between graduates engaging in IS and non-IS careers.

In Table 7.8 the presentation of the results from a cohort perspective provides a benchmark of positional averages across the sampling period. This establishes that across the four time periods, the number of positions has risen incrementally from 2.3 for Cohort 5 up to 6.6 for Cohort 1.

When viewed from a career stream perspective, these results clearly show that those defined in the hybrid career group, on average, with only one exception have consistently held more positions, than the other referent career groups. The single variation is Cohort 2 where the average is the same as the results for this time frame. The results for those pursuing dedicated IS careers are more closely aligned with the cohort averages, while graduates making up the non-IS career category, over time, have proved to be the least mobile group. Consistently, within each cohort they have held, on average, fewer positions than the result for each cohort regardless of career stream.

#### *7.2.4.5 Comparison of reasons for change*

The final perspective of work history mobility examines that when position changes did occur, the extent to which this was motivated by internal, external or 'other' reasons. To recap, in the context of this study, internal career movement was defined as indicative of job change within an existing employer organisation. External reasons were said to be based on leaving a position to begin work with a new employer. 'Other' reasons were included so that respondents could indicate when career movements had occurred for neither of the two previous options.

These results, involving the ranking of all four levels of analysis from the previous chapter are provided in Table 7.9. While there is no clear cut pattern in these results, what is evident is that largely positional movement occurred for external reasons. This result was supported both at the overall level, and, with the exception of Cohort 1, by the broader graduation cohort classifications. While it also held by career stream, the hybrid career group has been the exception. More often Cohort 1 and the hybrid career stream group attributed 'other' as the major determinant of positional move.

When the orientation to external reasons are further considered, looking at both career stream and cohort, it becomes evident that, over time, much of the career movement for those pursuing IS careers supports this result. In contrast, apart from Cohort 5, those engaging in non-IS careers have more often moved within the existing employer organisation. The results for the hybrid stream are diverse to the extent that no single reason can be said as influencing job change.

**Table 7.8: Career mobility comparisons**

| | Differentiated by graduation cohort and by career stream | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| | average positions | average positions | average positions | average positions | average positions |
| | 6.5 | 5.3 | 4.0 | 2.7 | 2.3 |
| **Information systems career stream** | 6.5 | 5.4 | 4.2 | 2.6 | 2.2 |
| **Hybrid career stream** | 8.5 | 5.3 | 4.7 | 3.9 | 3.0 |
| **Non-IS career stream** | 4.3 | 4.7 | 2.3 | 2.0 | 2.1 |

**Table 7.9: Reasons for change comparisons**

| | Overall | Differentiated by graduation cohort | | | | | Career stream | | | Information systems career stream by graduation cohort | | | | | Hybrid career stream by graduation cohort | | | | | Non-IS career stream by graduation cohort | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | IS | Hyb | Non | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| n= | 717 | 87 | 212 | 249 | 121 | 48 | 411 | 229 | 77 | 44 | 118 | 161 | 77 | 11 | 30 | 82 | 71 | 30 | 16 | 13 | 12 | 17 | 14 | 21 |
| | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank |
| internal | 1.5 | 1.6 | 1.1 | 2.1 | 1.3 | 2.5 | 1.5 | 2.9 | 1.6 | 1.0 | 1.4 | 2.2 | 1.3 | 1.0 | 3.0 | 1.0 | 3.0 | 1.5 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 3.0 |
| external | 1.0 | 3.9 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 2.6 | 1.0 | 2.9 | 1.0 | 1.0 | 1.0 | 2.4 | 2.9 | 1.6 | 1.8 | 1.0 | 2.2 | 2.8 | 2.5 | 1.5 | 1.0 | 1.0 |
| other | 3.0 | 1.0 | 3.7 | 2.9 | 3.0 | 3.0 | 2.9 | 1.0 | 3.0 | 2.6 | 2.9 | 3.0 | 2.9 | 2.8 | 1.0 | 2.9 | 1.0 | 3.0 | 2.9 | 1.5 | 1.9 | 2.9 | | 2.4 |

### 7.2.5 Research Question 1 Comparison - summary

This dimension of the results has revealed the following outcomes from the career experiences of these graduates. These are presented in accordance with the two major themes within the first research question, namely, career focus and career mobility:

**Career:**

- for those engaging in dedicated, IS careers, the dominant focus of career involvement has either been in systems development or IS management. However, it is also necessary to acknowledge that a systems development career could well, in time, progress to one in IS management;
- the results have highlighted that there is a considerable gap between the two major IS career areas and the remaining areas of career focus identified in this research;
- CSO careers and also careers based solely on programming have emerged as the secondary areas of career focus;
- in keeping with the literature and the IS recruitment survey, the major role for graduates from a computing science background has been programmer positions;
- the IS recruitment results show some indication of an increasing demand for personnel capable of filling multiple analyst/programming roles and a decrease in job opportunities for programmers;
- from a regional perspective, based on the results from the sampling of *The Mercury*, there were equal positional opportunities for programmers and computer systems officers;
- information systems major graduates reported a minimal involvement in programming positions;
- while there were some similarities in the IS positional roles reported and the results from the IS recruitment survey, there were also some differences. However, at the same time, role titles, in the absence of a description of the duties it encompasses, make it impossible to conclusively state these are mutually exclusive areas of IS employment;
- there was a great diversity in the non-IS roles reported by graduates classified in the hybrid career stream as demonstrated by the dominance of the 'other' category both overall and over time;
- the main career area for those following alternative, non-IS careers has been the pursuit of academic careers;
- the primary degree was demonstrated to be a determinant of the non-IS career involvement.

**Work history mobility:**

- the public or private business sector have almost equally offered employment opportunities for graduates, however, when organisation size is also taken into account, clearly large public sector organisations have been dominant in the careers of these graduates;

- Cohort 3 and Cohort 5 emerged as the exceptions in these results with the greater proportion of their career involvement being large private organisations;
- reflecting the overall results, the outcome from the IS career stream confirms the same pattern of primary career involvement in large public sector organisations and, again Cohort 3 and Cohort 5 have more frequently worked in private, and large, organisations;
- for the hybrid career stream, patterns of organisational involvement are less apparent. What is evident, however, is that for this group, small and medium sized private organisations increasingly emerge as key sources of employment;
- while large public sector organisations have been dominant employers of computer science major graduates following a non-IS career, for Cohort 1, medium sized organisations have provided the major career opportunities;
- small private organisations have proved the main source of employment for Cohort 5 in the non-IS career stream;
- a comparison of the geographical movement of graduates in the course of their careers shows that Tasmania, with only one exception, has remained the most frequently reported work destination. The variation was Cohort 1 in the hybrid career stream where the UK was the most often reported location;
- while there has been a wide diversity of work locations, largely graduate career involvement has centred in the major Australian population centres;
- the diversity and extent of travel in the course of graduate careers has been highest among those in Cohort 3 in the hybrid career stream;
- to a lesser extent those making up Cohort 3 in the information systems career stream have by comparison in that career group have also been more highly mobile and to a greater number of destinations;
- the non-IS career group appears to be the most geographically stable career group;
- the comparative summary of the results for positional mobility has shown that, over time, the average number of appointments has incrementally increased and that the hybrid career group has been more highly mobile than those following dedicated IS careers. The alternative, non-IS career group has been the least mobile career stream;
- no single pattern emerges from the results of the reasons for positional change, although external reasons were the most frequently cited reasons indicated for movement;
- over time, those pursuing IS careers most often left for external reasons while graduates engaged in non-IS careers were more likely to have changed due to internal cause. No clear pattern emerged in the results for the hybrid career stream.

## 7.3 Research Question 2

In this section the focus moves to the second research question and here a comparative analysis of the various levels of the results provided in Chapter Six will be provided.

To recap, the second research question queried:
*With reference to the initial post-graduation appointment and with a particular focus on original career choice, business sector and geographic location, how did graduates approach gaining and accepting the position and what is the extent of their mobility when engaged in this role?*

Figure 7.2 provides a graphical summary of the results in relation to gender, bachelor degree qualification and initial career focus to re-establish a context for this portion of the results. The firm olive green line traces the link between gender, degree and IS role as the first, post-graduation appointment. The dashed blue line shows the same distributions but involving initial positions in alternative, non-IS related areas. Again this figure excludes details of degrees previously noted as only minimally represented in the results. To recap, what this clearly shows is that nearly two thirds of these graduates, from a range of degree qualifications, embarked on their careers in the IS profession.

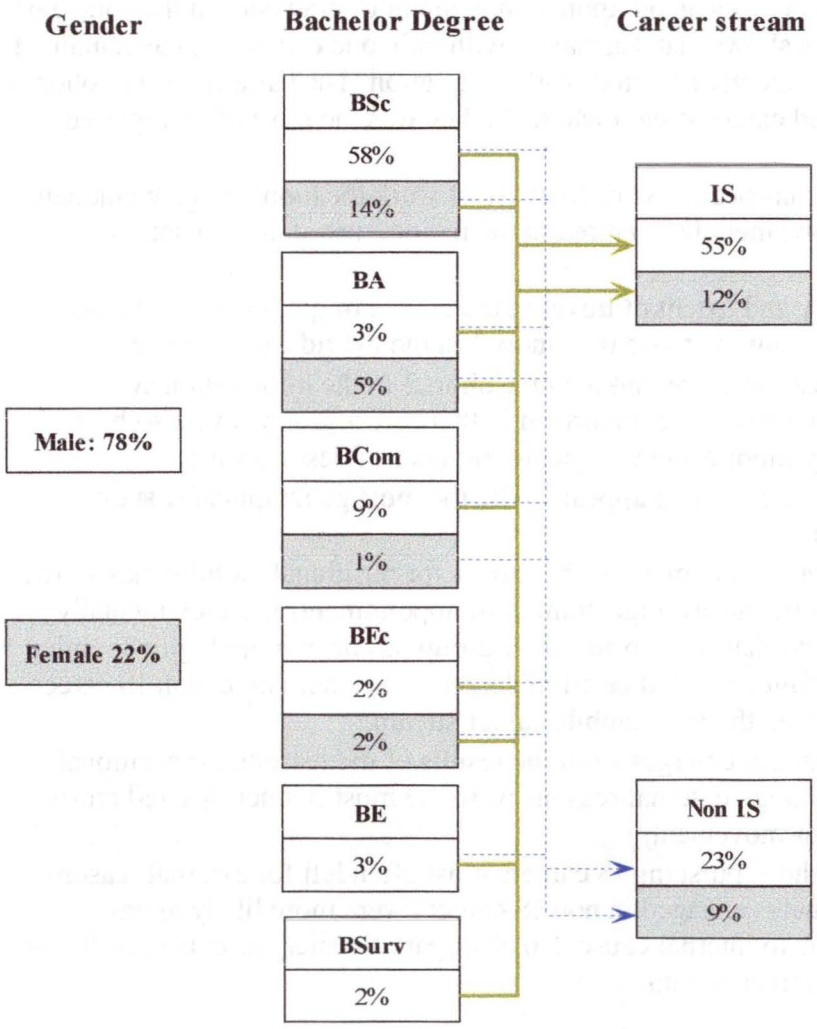


**Figure 7.2: Initial position by gender, degree & role focus**

### 7.3.1 Comparison Initial IS positional involvement

Table 7.10 provides a comparative summary of the roles identified from the work histories of graduates who began their careers working in an IS capacity. This aspect shows the results both overall, and when the differentiated into the cohort time frames. This table also includes the results for entry level IS positions from the IS recruitment survey. Here also, the overall and periodic sampling results are presented. Consequently, this view of the results is an opportunity to match the outcomes between actual graduate data and labour market demand.

What the normalised rankings serve to support is the dominance of programming activities in the initial stage of a potential IS careers (Tanniru 1983). The results, both from the newspaper survey and the graduate survey, clearly demonstrate the significance of programmer appointments in an early IS career. This outcome, however, is limited to graduates who completed a computer science major. A majority of graduates from an information systems background have started their careers employed as CSOs (as explained earlier in the thesis, this is the generic government computer systems officer title). The results also highlight that whereas organisations have increasingly sought people capable of filling analyst/programmers duties, based on the career experiences of graduates, far fewer have embarked on their careers in this capacity.

Apart from these three roles, the remaining roles reported by graduates are not only diverse, but widely distributed. While graduates have reported position titles not found in the recruitment survey, likewise the newspaper survey contained potentially initial IS roles outside the scope of the graduate experiences.

**Table 7.10: IS positional roles comparisons**

| | IS recruitment survey | | | | | | Graduate career survey | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Overall | Periodic samplings | | | | | Overall | Graduation cohorts | | | | |
| | | 1 | 2 | 3 | 4 | 5 | | 1 | 2 | 3 | 4 | 5 |
| n= | 2315 | 343 | 315 | 758 | 454 | 445 | 170 | 11 | 36 | 61 | 51 | 10 |
| | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank | rank |
| programmer | 1.0 | 1.0 | 1.0 | 3.0 | 1.9 | 6.8 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 11.0 |
| analyst programmer | 1.7 | 6.4 | 3.3 | 1.0 | 1.0 | 1.0 | 17.6 | 6.0 | 8.2 | 6.9 | 11.0 | 11.0 |
| CSO | 10.0 | 9.9 | 11.9 | 10.5 | 6.7 | 8.5 | 18.6 | 6.0 | 9.3 | 8.9 | 9.5 | 1.0 |
| consultant | 15.2 | 10.3 | 12.2 | 14.0 | 13.5 | 13.1 | 21.8 | | | 8.9 | 13.3 | 11.0 |
| engineer | 14.3 | 10.2 | 12.0 | 13.4 | 12.9 | 10.4 | 22.2 | | 8.8 | 9.5 | 13.3 | |
| support | 15.1 | | | 14.3 | 12.9 | 11.6 | 23.3 | | 9.9 | 9.5 | 14.1 | |
| DBA | 15.5 | | 12.4 | 14.0 | 13.6 | 13.5 | 23.3 | | 9.3 | 9.8 | 14.9 | |
| teacher | | | | | | | 23.9 | | 9.3 | | 14.1 | |
| analyst | 9.5 | 6.7 | 6.9 | 10.4 | 8.4 | 8.9 | 24.3 | | 9.9 | | 14.9 | 11.0 |
| manager | | | | | | | 24.3 | 6.0 | | | 14.9 | 11.0 |
| trainer | | | | | | | 24.6 | | 9.9 | 10.2 | | |
| tutor | | | | | | | 24.6 | 6.0 | | | 14.9 | |
| assistant | | | | | | | 24.6 | | 9.9 | | | |
| help desk | | | | | | | 25.0 | | | | 14.9 | |
| coordinator | | | | | | | 25.0 | | | | 14.9 | |
| lecturer | | | | | | | 25.0 | | 9.9 | | | |
| network analyst | | | | | | | 25.0 | | 9.9 | | | |
| software officer | | | | | | | 25.0 | | | | | 11.0 |
| PD research fellow | | | | | | | 25.0 | | | 10.2 | | |
| sales executive | | | | | | | 25.0 | | | | 14.9 | |
| computer scientist | | | | | | | 25.0 | | | 10.2 | | |
| technician | | | | | | | 25.0 | | | | 14.9 | |
| webmaster | | | | | | | 25.0 | | | | | 11.0 |
| specialist | 15.4 | 10.6 | | 13.9 | 13.5 | 12.8 | | | | | | |
| professional | 15.5 | 10.5 | 12.2 | 14.0 | 13.9 | 13.5 | | | | | | |
| auditor | 15.6 | 10.5 | 12.2 | 13.8 | 13.8 | 14.7 | | | | | | |
| designer | 15.8 | 10.4 | 12.5 | 14.4 | 14.3 | 13.6 | | | | | | |
| supervisor | 16.1 | | 12.5 | 14.7 | 14.3 | 14.7 | | | | | | |
| technologist | 16.2 | | | 14.6 | 14.3 | 14.6 | | | | | | |
| instructor | 16.2 | | 12.5 | 14.7 | | 14.6 | | | | | | |

### 7.3.2 Comparison initial non-IS positional involvement

Table 7.11 presents a comparative view of the positional activity of graduates who began their careers working in alternative, non-IS roles. This encompasses two aspects - the overall results then those when the data are further refined to reflect a time perspective. At the higher level of the results the large gap in the ranking indicates the wide diversity of positions these graduates filled. Further, when the extremes of the rankings are also considered this supports the greater variance of role involvement among this graduate category as compared with those defined in the initial IS stream.

The only role that has been commonly reported across all five cohorts is teaching positions and, clearly, over time, graduate involvement in this area has declined. While this was the dominant area of employment for Cohort 1 and Cohort 2, a greater number of graduates from Cohort 3 embarked on their careers working as engineers. Within this group teaching positions, along with officer roles represented the secondary sources of initial employment. Similarly, for Cohort 4 graduates the main focus was not teaching, but appointments as scientists or analysts. Cohort 5

graduates, meaning those from an information systems background, have more commonly began their careers working in officer appointments. This result implies government appointments but in non-IS related areas. In more recent times, although to a lesser extent, accountancy and engineering appointments have consistently been reported.

What does become apparent from the presentation of the results in this format is the wide diversity of initial roles especially for Cohort 4. This subset of the data is based on a total of 20 responses which implies that the only common roles within this group were the two emerging as dominant: scientists or analyst positions.

**Table 7.11: Non-IS positional roles comparisons**

| | Overall | Graduation cohorts | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| n= | 81 | 5 | 12 | 20 | 20 | 24 |
| | | rank | rank | rank | rank | rank |
| teacher | 1.0 | 1.0 | 1.0 | 4.5 | 18.0 | 11.4 |
| officer | 13.6 | | | 4.5 | 18.0 | 1.0 |
| accountant | 17.8 | | 5.1 | 11.5 | 18.0 | 7.3 |
| manager | 19.9 | | | 8.0 | | 3.1 |
| engineer | 21.9 | | 5.1 | 1.0 | 18.0 | |
| clerk | 24.1 | | | 11.5 | | 9.4 |
| graduate | 24.1 | | | | 18.0 | |
| assessor | 28.2 | | 5.1 | | 18.0 | |
| auditor | 28.2 | | | | | 11.4 |
| PD research | 28.2 | 2.2 | 5.1 | | 18.0 | |
| scientist | 28.2 | | | 11.5 | 1.0 | |
| support | 28.2 | | | | 18.0 | 11.4 |
| tutor | 28.2 | | 5.1 | | 18.0 | |
| analyst | 28.2 | | | 11.5 | 1.0 | |
| actuarial trainee | 30.4 | | | 11.5 | | |
| administrator | 30.4 | | | | | 11.4 |
| chef | 30.4 | | | | 18.0 | |
| croupier | 30.4 | | | | 18.0 | |
| draftsman | 30.4 | | | | 18.0 | |
| enterprise facilitator | 30.4 | | | | | 11.4 |
| solicitor | 30.4 | | | 11.5 | | |
| geophysical operator | 30.4 | | | | | 11.4 |
| lecturer | 30.4 | | | | 18.0 | |
| production stager | 30.4 | | 5.1 | | | |
| sales | 30.4 | | | | | 11.4 |
| security | 30.4 | | | 11.5 | | |
| supervisor | 30.4 | | | | 18.0 | |
| surveyor | 30.4 | | | | 18.0 | |
| technician | 30.4 | | | | | 11.4 |
| tester | 30.4 | | | | 18.0 | |
| trainer | 30.4 | | | 11.5 | | |

### 7.3.3 Comparison initial work history mobility

#### *7.3.3.1 Comparison initial employment by business sector*

Table 7.12 highlights that, with only one exception (Cohort 5), the public sector has proved to be the dominant source of initial employment opportunities for graduates. This pattern extends overall, regardless of whether the initial role was IS or non-IS,

and over time with respect to the computer science major graduates. Although it needs to be pointed out that for the non-IS positional category and Cohort 1 and Cohort 3, the difference between the two main sectors was only marginal. Cohort 5 graduates, on the other hand, more frequently reported starting their work careers in the private sector.

**Table 7.12: Business sector employment mobility comparisons**

| | Overall | Initial role | | Cohort | | | | |
|---|---|---|---|---|---|---|---|---|
| | | IS | Non-IS | 1 | 2 | 3 | 4 | 5 |
| n= | 251 | 170 | 81 | 16 | 48 | 81 | 72 | 34 |
| | rank | rank | rank | rank | rank | rank | rank | rank |
| Public | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 2.2 |
| GBE | 3.7 | 3.8 | 3.2 | | 2.7 | 3.0 | 4.0 | 5.1 |
| Private | 2.2 | 2.3 | 1.9 | 1.8 | 2.6 | 1.2 | 2.2 | 1.0 |
| Other | 4.2 | 4.4 | | | | | 4.2 | 5.7 |

### *7.3.3.2 Comparison initial employment by size of organisation*

At a finer level of detail (refer to Table 7.13), when the distribution of graduate employment also compares different sizes of organisations, then again the role of the public sector, in particular, large sized institutions clearly becomes apparent. The pattern established in the previous results does not change, with different outcomes based on undergraduate stream and initial career involvement. While a majority of those from an information systems background again gained early career appointments in the private sector, here also, this was most often in large companies.

**Table 7.13: Employment in small, medium & large organisations comparisons**

| | Overall | Initial role | | Cohort | | | | |
|---|---|---|---|---|---|---|---|---|
| | | IS | Non-IS | 1 | 2 | 3 | 4 | 5 |
| n= | 251 | 170 | 81 | 16 | 48 | 81 | 72 | 34 |
| | rank | rank | rank | rank | rank | rank | rank | rank |
| **Public** | | | | | | | | |
| large | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.9 |
| medium | 7.3 | 7.6 | 6.7 | 4.1 | 6.0 | 5.4 | 8.2 | 9.9 |
| small | 9.0 | 9.1 | 8.9 | 4.9 | 8.0 | | 9.3 | 9.9 |
| **GBE** | | | | | | | | |
| large | 7.8 | 7.9 | 7.7 | | 6.8 | 5.2 | 8.8 | 9.0 |
| medium | 9.3 | 9.5 | 8.9 | | 8.0 | 6.9 | | |
| small | 9.4 | | 8.9 | | | | | 9.9 |
| **Private** | | | | | | | | |
| large | 5.4 | 5.3 | 5.4 | 4.9 | 6.8 | 2.5 | 6.5 | 1.0 |
| medium | 8.2 | 8.3 | 8.2 | 4.9 | 8.0 | 5.8 | 8.5 | 9.0 |
| small | 7.8 | 8.3 | 6.7 | | 7.7 | 5.8 | 7.4 | 7.2 |
| **Other** | 9.2 | 9.3 | | | | | 9.3 | 9.9 |

### *7.3.3.3.Comparison initial employment by geographical location*

Within the second research question, the next aspect of work history mobility provides a comparative view of the geographical distributions where graduates launched their careers. Table 7.14 presents these results and serves to highlight that Tasmania, regardless of time or initial career focus, has clearly been the dominant work location. From overall and role focus perspectives, there is also a clearly defined gap between this state and other centres where graduates moved to begin their careers. Graduates who did leave Tasmania tended to go to the major Australian population centres, New South Wales, Victoria or the ACT. From the literature these

three locations are the dominant areas of IS employment in Australia (Cameron 1991).

Those establishing their careers in an IS capacity appear to have been more likely to relocate by comparison with those embarking on their working career in other positional areas. When both the positional focus and time are considered, then this shows that the movement in Cohort 1, Cohort 2 and, to a lesser extent, Cohort 5 have been limited as compared with Cohort 3 and, less frequently, Cohort 4.

**Table 7.14: Geographical employment mobility comparisons**

| | **Overall** | **Initial role** | | **Cohort** | | | | |
|---|---|---|---|---|---|---|---|---|
| | | IS | Non-IS | 1 | 2 | 3 | 4 | 5 |
| n= | 251 | 170 | 81 | 16 | 48 | 81 | 72 | 34 |
| | rank | rank | rank | rank | rank | rank | rank | rank |
| Tasmania | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Victoria | 10.9 | 9.0 | 7.9 | 3.8 | 2.9 | 7.2 | 6.4 | 4.7 |
| ACT | 11.5 | 9.8 | 8.0 | 2.9 | 2.5 | 9.4 | 7.3 | 5.1 |
| New South Wales | 12.4 | 10.9 | 8.3 | | | 10.6 | 6.7 | 4.4 |
| Australia wide | 13.3 | 12.1 | 8.5 | | | 11.1 | 7.5 | 5.1 |
| South Australia | 13.5 | 12.2 | | | | 11.1 | | |
| UK | 13.5 | 12.3 | 8.5 | 3.8 | | | 7.5 | |
| Northern Territory | 13.6 | | 8.5 | | | 11.4 | | |
| Queensland | 13.6 | 12.3 | | | | 11.4 | | |
| USA | 13.6 | 12.3 | | | | | 7.5 | |
| New Zealand | 13.6 | 12.3 | | | | 11.4 | | |
| Japan | 13.6 | | 8.5 | | | 11.4 | | |
| Netherlands | 13.6 | | 8.5 | | | 11.4 | | |

#### *7.3.3.4 Comparison of means of finding initial appointment*

Based on the comparison of the various aspects of the results in relation to the sources graduates used when seeking work, no one single means emerged as dominant. As Table 7.15 shows, while overall, newspaper recruitment advertisements were the key approach used when seeking work, the high incidence of this means has been limited to more recent graduates. In particular, Cohort 4 and Cohort 5. Those embarking on their careers in IS appointments, more frequently engaged the services of the University careers office, and significantly, many also reported being approached by prospective employers. To a similar extent, these graduates initially engaging in IS careers made personal approaches to organisations in seeking work. 'Other' reasons were dominant in the non-IS career group, and from the cohort divisions of these results, the fact this outcome is also repeated in Cohort 1, suggests the influence of Education Department scholarships.

**Table 7.15: Means of job search comparisons**

| | Overall | Initial role | | Cohort | | | | |
|---|---|---|---|---|---|---|---|---|
| | | IS | Non-IS | 1 | 2 | 3 | 4 | 5 |
| n= | 303 | 200 | 103 | 22 | 60 | 97 | 83 | 41 |
| | | rank | rank | rank | rank | rank | rank | rank |
| Newspaper advertisement | 1.0 | 2.1 | 6.3 | 4.6 | 1.0 | 2.4 | 1.0 | 1.0 |
| Careers office | 3.2 | 1.0 | 6.5 | 4.6 | 2.1 | 1.0 | 4.5 | 6.8 |
| Other | 4.4 | 3.0 | 1.0 | 1.0 | 2.6 | 3.6 | 4.3 | 4.7 |
| Employer approach | 5.8 | 1.9 | 6.6 | 2.8 | 4.2 | 4.2 | 4.5 | 6.8 |
| Personal approach | 5.5 | 1.9 | 8.4 | 5.5 | 3.6 | 4.0 | 4.3 | 5.7 |
| Job extension | 6.9 | 4.7 | 4.4 | 5.5 | 6.8 | 4.5 | 5.3 | 5.2 |

### *7.3.3.5 Comparison acceptance criteria initial appointment*

Table 7.16 provides a comparative insight into what factors influence graduates to accept an initial position. It highlights that, with only the except of Cohort 1 (again attributable to scholarship contracts) the 'prospects' of a position was the key determinant influencing graduates to accept their initial appointment. Against the literature, location was the second most often considered criteria (Arnold & MacKenzie Davey 1992). Although in this result there is evidence to support this was more frequently taken into account by those starting their careers in non-IS positions, and, from a time perspective, limited to Cohort 2 and Cohort 4.

The considerable gap in the ranking between prospects and location for Cohort 5, suggests that these graduates were more inclined to relocate to establish a career. In particular, this outcome can be closely related to the outcome for the Cohort 5 IS career stream presented in Table 7.7. This result demonstrated an even geographical distribution for this group between Tasmania, New South Wales and Victoria.

**Table 7.16: Job acceptance criteria comparisons**

| | Overall | Initial role | | Cohort | | | | |
|---|---|---|---|---|---|---|---|---|
| | | IS | Non-IS | 1 | 2 | 3 | 4 | 5 |
| n= | 707 | 475 | 232 | 27 | 136 | 244 | 210 | 90 |
| | rank | rank | rank | rank | rank | rank | rank | rank |
| Prospects | 1.0 | 1.0 | 1.0 | 4.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Location | 2.2 | 2.8 | 1.4 | 4.0 | 1.3 | 2.6 | 1.9 | 5.0 |
| Organisation | 3.7 | 4.2 | 4.2 | 4.0 | 4.7 | 3.9 | 2.8 | 5.4 |
| Salary | 4.2 | 4.4 | 5.7 | 6.2 | 6.5 | 4.3 | 4.1 | 6.1 |
| Training | 4.7 | 4.9 | 6.4 | 6.9 | 5.9 | 4.8 | 6.0 | 5.7 |
| Technology | 4.7 | 4.9 | 6.9 | | 6.5 | 5.7 | 3.9 | 6.7 |
| Other | 5.1 | 5.7 | 6.2 | 1.0 | 5.0 | 6.4 | 6.9 | 7.4 |
| Travel | 6.4 | 7.1 | 8.0 | | 8.4 | 7.1 | 7.6 | 8.1 |

### *7.3.3.6 Comparison duration of initial position*

The next aspect of work history mobility compares from all four levels of analysis in relation to the extent of mobility in relation to the initial post-graduation appointment of these graduates (Table 7.17).

This shows that while overall graduates remained in their first career positions for just over two years, those who embarked on their careers in a non-IS role tended to stay longer than those who were engaged in an IS capacity. Taken from a cohort perspective, the results largely follow the overall result. That is, commonly the duration was more generally around 2.3 years. At the finest level of detail, for

graduates working as IS personnel, there is some evidence to support that the mobility has been higher. However, it has been established the difference between this portion of the results was demonstrated not to have been statistically significant.

**Table 7.17: On average initial appointment mobility comparisons**

| Overall | 2.3 years | | | | |
|---|---|---|---|---|---|
| Industry focus | IS role | 2.2 years | Non-IS role | 2.7 years | |
| Cohort | Cohort 1 | Cohort 2 | Cohort 3 | Cohort 4 | Cohort 5 |
| | 2.2 years | 2.3 years | 2.5 years | 2.3 years | 2.5 years |
| Cohort/industry focus | | | | | |
| IS role | 1.9 years | 2.2 years | 2.4 years | 2.3 years | 1.5 years |
| Non-IS role | 5.5 years | 2.3 years | 3.3 years | 2.3 years | 3.0 years |

### *7.3.3.7 Comparisons reasons for initial positional change*

Table 7.18 provides the final ranked comparative summary of the reasons graduates reported for leaving their initial career appointment. Presented in this format, there is some evidence to support that graduates mainly left their first career role to take up an appointment in a different employer organisation. However, from the overall perspective and also that of the IS career group, the distribution between external and internal career movement is less differentiated. That is, neither of these two reasons have emerged as the more dominant cause for the positional change of these graduates. Clearly, for the non-IS career group, change most often occurred for external movement. Over time, with the exception yet again of Cohort 1, generally the outcome is the same as that reported at the overall perspective. That is, the distribution between external or internal has been evenly balanced.

**Table 7.18: Reasons for change comparisons**

| | **Overall** | **Initial role** | | **Cohort** | | | | |
|---|---|---|---|---|---|---|---|---|
| | | IS | Non-IS | 1 | 2 | 3 | 4 | 5 |
| n= | 208 | 146 | 62 | 14 | 47 | 73 | 48 | 26 |
| | | rank | rank | rank | rank | rank | rank | rank |
| External | 1.0 | 1.0 | 1.0 | 3.0 | 1.0 | 1.0 | 1.6 | 1.0 |
| Internal | 1.9 | 1.4 | 2.6 | 1.0 | 2.3 | 2.4 | 1.0 | 2.3 |
| Other | 2.8 | 2.9 | 2.9 | 1.0 | 2.9 | 2.9 | 2.8 | 3.0 |

## 7.3.4 Research Question 2 comparison - summary

In relation to the first, post graduation career appointment, the comparative results are summarised according to the three major aspects that formed the basis for the second research question. These were the focus of the initial area of career activity, mobility and sources of job search and position acceptance. In particular, this approach has established that:

**Initial role focus:**

- for graduates from a computer science background, the dominant entry level position has been that of programmer;
- while overall the entry level appointment from the IS recruitment survey support programming to be the highest recruited position in the industry, in the three most recent sampling time frames, analyst/programmer positions have emerged as being in greater demand;

- information systems graduate more often embarked on their careers working in government, CSO positions;
- there was a large diversity in the initial career roles reported by graduates, both in the extent of those reported and also in comparison with the IS recruitment survey data;
- for two earliest computer science major graduate cohorts beginning their careers in non-IS employment, teaching appointments have dominated as the initial career appointment. For the two more recent cohorts in this undergraduate group, the most frequently reported positions have been engineer and analyst roles;
- graduates from an information systems major starting their careers in non-IS areas more frequently have launched their careers in officer positions;
- Cohort 4 graduates were found to have a great diversity in the areas of their initial positional roles.

**Work history mobility:**

- overall, regardless of initial career focus computer science major graduates have embarked on their careers in the public sector and, from an organisational perspective, large institutions;
- graduates from an information systems background have more commonly established their careers in large, private sector organisations;
- across all perspectives of analysis, Tasmania has continued to be the major geographical location for the initial career position. The extent of the focus in this state is emphasised by the size of the gap overall between here and the second most frequently reported location, Victoria;
- graduates initially taking up IS positions, by comparison with those starting their careers in other areas, travelled more widely;
- Cohort 3 was the most diverse cohort in terms of geographical distribution in the first career appointment;
- mobility in relation to the first post graduation appointment was highest for Cohort 1 and Cohort 5 in the IS positional group;
- patterns of reasons for change are similar in the overall and role focussed results, however these have varied when considered over time.

**Sources of job search and position acceptance:**

- there has been little commonality in the means graduates used to seek their initial appointment;
- with the exception of Cohort 5, clearly graduates perceived the prospects of a position as the dominant criteria determining acceptance;
- location was the second most frequently cited reason driving the positional choice;
- graduates considered the opportunity for travel as the least incentive to take up an appointment.

## 7.4 Summary

In this chapter the relevant aspects of the various levels of analysis for each of the two research questions have been combined to provide a comparative report of the

results presented in the two previous chapters. To enable a clear distinction to be made between the extent of variation in the results within each level included, the percentages have been normalised. This approach was adopted to refresh memory of the results in a form that readily demonstrated the differences between the results at the various levels of analysis. As proposed at the beginning of this chapter, the application of this process has also served to establish a basis for the discussion of the results to follow in the final chapter of this thesis.

# CHAPTER EIGHT: Conclusions, discussion and future research

## 8.1 Introduction

In this final chapter of this thesis, the aim is to:

- revisit the major findings from this research;
- discuss aspects arising as a result of this research;
- summarise the issues addressed by the two research questions;
- propose the perceived benefits of this research;
- present the practical and theoretical contributions of this research;
- acknowledge potential limitations of this research;
- encourage further work by offering suggestions for future research.

## 8.2 Revisiting the major findings from this research

This research was motivated by the dearth of IS career research, not only in Australia but worldwide. It was constructed to gain some insight into two key characteristics of the IS labour force, the chronic shortage of skilled IS personnel and the perception that by comparison with other labour force sectors, IS professionals are prone to above average job mobility.

To address this perceived research problem two research questions were constructed to encapsulate the following objectives, namely to:

1. determine the extent to which graduates with a tertiary level of skills and knowledge to enter the IS industry pursued dedicated IS careers;
2. determine the extent to which graduates intermittently engaged in IS positional roles during the course of their careers;
3. ascertain the extent and areas of alternative careers taken up by these graduates;
4. examine the career mobility of graduates and compare for any differences between career focus, undergraduate majors in computer science or information systems and careers established at different points in time within the twenty year sampling period;
5. explore the extent to which the career movement of these graduates has been internally or externally motivated;
6. examine the first post-graduation career appointments of these graduates to determine the extent to which they initiated careers in the IS industry;
7. determine the extent to which these graduates embarked on their careers according to business sector involvement and geographical location;
8. examine the positional mobility in the initial post-graduation appointment;
9. gain knowledge of the criteria graduates commonly apply when seeking initial career appointments and the reasons that underlie the decision to accept a particular position.

**Research Question 1:**
This question was based on meeting the first five research objectives.

*With a particular focus on career and work history mobility, what are the career experiences of graduates from the Department of Computer Science at the University of Tasmania who gained a bachelor degree based on a major in either computer science or information systems?*

The results have revealed a number of differences between the career outcomes for computer science or information systems graduates. For this reason, it is proposed to consider each separately with reference to the three career streams established in this research. This implies careers solely focussed in IS, alternative, non-IS related careers or hybrid careers. Initially, the emerging patterns in the careers of computer major science graduates engaging in dedicated IS careers will be presented. It will be followed by a description of the career experiences of information systems major graduates also pursuing IS focussed careers.

### 8.2.1 Dedicated IS careers

The analysis of the work histories of graduates spanning a twenty year period has determined that over half (56%) have pursued dedicated IS careers.

#### *8.2.1.1 The IS careers of computer science major graduates*

This result is true for the vast majority of Bachelor of Science graduates whose award was based on a computer science major. From this result, it is proposed that this tertiary background can be seen as a reasonably strong determinant of a career dedicated to working in the IS profession. Nearly two-thirds (61%) of graduates whose bachelor award was based on a computer science major, have reported careers solely focussed in the IS industry.

The outcome of this research also supports that many of IS careers have progressed in the traditional primary focus of the IS industry: systems development. A smaller number of graduates have gone on to the next natural career progression and worked in IS management. This outcome reflects the involvement of many earlier graduates in bureaucratic careers.

While the results have shown that a majority of graduates for the most recent computer science major group reported IS management focussed careers, this should not be taken as indicative of a high proportion of accelerated careers in this group. Although many graduates from Cohort 4 have also spent the bulk of their working life in large public organisations, the second dominant source of employment has been in small, private sector businesses. Some of these graduates may have been required to assume the responsibility for the IT resources in such businesses, leading to reports of managerial careers and imply responsibility for a minor operation in the overall organisational activities.

To a lesser extent, the careers of other graduates have involved employment in areas dedicated to either CSO or programming. The inability to distinguish the actual areas of IS role activity in CSO responses meant it was not possible to identify these careers to any greater descriptive outcome. Potentially, many of these careers may also have followed the traditional systems development career path.

Programmer positions have been dominant in the careers of these graduates and, the fact that some graduates have remained working in this capacity throughout their careers, suggests that a number could have preferred technologically oriented careers rather than moving to more general areas. The considerable career involvement of those following dedicated IS careers in large public sector organisations may well have precluded a number of these graduates from the opportunity to advance to higher, and less populated levels in the bureaucratic hierarchy.

While the careers of these graduates have increasingly encompassed a wide variety of IS roles, reflecting that systems development has proved the central career area, they have reported considerable involvement although to a lesser extent, as analyst/programmers, managers or analysts. A comparison of positional titles from the graduate career survey and the IS recruitment survey has revealed that while there is much overlap between IS positional appointments, based on the practical experiences of graduates, there has also been a wide variety of often unique roles named.

Although the careers of these graduates have been almost equally divided between employment in the public and private business sectors, there is evidence of a move in recent times towards greater private sector positional involvement.

Even though the major Australian population centres (Victoria, New South Wales or the ACT) have been recognised as the key locations for IS career opportunities (Cameron 1991), for these graduates Tasmania has clearly been the dominant area for the career involvement. The comparative summary of geographical mobility as presented in Table 7.7 clearly confirmed this result.

Although many of the earlier graduates frequently reported working in the ACT, over time Victoria and New South Wales have increasingly attracted graduates. While graduates have worked in a widely dispersed number of destinations, the UK has been perhaps the most popular overseas location.

Against the literature, these graduates have not proved to be the most highly mobile group (Bartol 1983); (Guimaraes 1992). The results for the average number of positional appointments, among those following dedicated IS careers, has reflected the outcomes almost equal to the results for each of the four cohorts regardless of career focus. Graduates engaged in this IS career stream have more commonly left positional appointments due to external cause, implying considerable movement for this group between employer organisations.

#### *8.2.1.2 The IS careers of information systems major graduates*

Approximately 14% of respondents who were employed at the time when the graduate career survey was administered, gained their bachelor degrees based on an information systems major. Of these graduates, just over one quarter were defined within the IS career stream. On this basis, it is proposed that the results for this group have been shown to be less decisive as a predictor of a subsequent IS career when compared to the outcome for the computer science major group.

While the work histories of this graduate group are relatively limited, an insight into their careers has suggested a tendency for them to be in the early stages of career largely involving systems development or management activities. The remaining career areas have been classified as government based careers such as CSOs or else in consultant, network and internet activities.

Apart from the lack of any involvement in dedicated programming positions, to date the careers of these graduates have more commonly been based in similar central areas of positional activity as that reported by the computer science major graduate IS career stream group. That is, they have been employed as analyst/programmers, managers, analysts, CSOs or graduate trainees. While large private organisations have been central in their careers to date, a number of these graduates have also reported managerial positions. This last result is similar to that for the most recent computer science major Cohort 4 group. Given that Cohort 4 and Cohort 5, defined in the graduate career survey, span the same time period, this outcome could support that there has been some broadening in the scope of activities within the IS industry. Other less frequently reported roles Cohort 5 graduates have filled have been in webmaster or support activities. Possibly reflecting their more business orientated tertiary background, others have also been employed as consultants or administrators.

A majority of the careers of this graduate/career group have been spent in large private sector organisations. This outcome further supports the identified trend away from government organisations as being central to employment opportunities for graduates. The geographical distribution of the employment for this information systems dedicated IS career group has been limited to three locations. Tasmania was again the dominant source of employment, although the difference between this state and New South Wales or Victoria was closer than the outcome for computer science major graduates. This outcome could suggest that this initial group of information systems graduates have found it necessary to travel to centres where there are many more employment opportunities in the IS industry. It could also have been driven by a limited scope for career advancement in Tasmania for graduates whose credentials are based on a relatively recent area of tertiary qualification.

The positional mobility of these graduates follows the pattern for their computer science counterparts. That is, the average number of appointments echoes the result for Cohort 5 as a whole. The main motivation for these graduates to change appointment has been internal career movement which implies moving to a new role in the existing employer organisation.

### 8.2.2 Hybrid career stream

The careers of approximately one quarter of the respondents to the graduate career survey were defined as hybrid careers. Within the computer science undergraduate major group, this represented 24% graduates respondents from this undergraduate major background.

#### *8.2.2.1 The hybrid careers of computer science major graduates*

For this career group the focus must be limited to describing the extent and areas of their involvement in either IS or non-IS appointments. The results in Chapter Five established that involvement in either capacity, whether overall or across the four

cohorts, to have been closely divided. When these graduates have worked in an IS capacity, while largely this has involved programming, post 1985 the extent of this activity has declined to be supplanted by IS management positions. The remaining IS roles recorded in the work histories of this group have mostly been similar to those reported by graduates engaging in dedicated IS careers. Positional titles such as auditor, systems strategist or technical document writer (all defined by respondents as IS positions) have been unique to this group.

Outside IS roles, it is evident that these graduates have been employed in a diversity of positions, wide enough to defy classification and describing over one third of these non-IS positions. While for the earliest graduates the next most common position was teaching, more recent graduates have not pursued this avenue of employment to anywhere near the same extent. There is also some evidence that a number of earlier graduates, in particular, have moved from a dedicated IS career stream to more general managerial duties. An even smaller number have taken up directorship appointments.

While overall the dominant source of career opportunities for these graduates has been the private sector, over time this pattern has persisted with the exception of Cohort 2, where the public sector has proved the major employer.

Based on size of organisation, large establishments more often have provided positions for Cohorts 2 and Cohort 4. However, what does emerge is that medium sized, and more recently (again post 1985) small business in the private sector have been significant employers. Within this research, a large business has been defined as having 101 or more employees, a medium organisation between 21 to 100 staff, and a small establishment as one based on a total workforce of up to 20 people.

When viewed overall, Tasmania has clearly been the major work destination for these graduates. With the exception was Cohort 1, across the graduation cohorts Tasmania has continued to be the key destination. There is a considerable gap between this state and the large number of widely diverse locations reported. The majority of positional appointments for this first graduate group have been in the UK. Cohort 3 in this hybrid career stream has also been the most widely travelled in the course of their careers.

Generally, this hybrid career group have tended to be more highly mobile in terms of average number of appointments compared with the cohort averages regardless of career stream classification. This is clearly evident for Cohort 1, and, given many of these graduates held a considerable number of positions in the UK, this result could support short term work engagements combined with travel between tourist destinations in that country. Supporting this is the fact that 'other' reasons for positional change were most commonly reported for both Cohort 1, as was also the case for the most diversely travelled Cohort 3 group.

#### *8.2.2.2 The hybrid careers of information systems major graduates*

The extent to which graduates from an information systems background have engaged in hybrid careers is almost the same as for those from the information systems stream that continued to dedicated IS careers. That is, 23% of graduates from this undergraduate major have worked between IS and non-IS positions.

While this group represents only a relatively small sample (7), with one exception the IS role involvement of this group overlaps with a number of positions reported by their counterparts in the first career stream. While these graduates have also been employed as analyst/programmers, analysts, CSOs, administrators, support personnel and consultants, none have been engaged as managers.

The non-IS employment for this group has mainly been in a wide range of diverse areas, so again the 'other' category was the dominant classification. Beyond this, and possibly reflecting an equal distribution of employment in large public sector organisations, officer positions were a secondary area of involvement. Other less extensively reported non-IS roles making up the work histories of this group include teacher, manager and accountant.

Tasmania has again been central to the employment opportunities for this group with only three other destinations reported: Victoria, New South Wales and the UK. In the course of their careers these graduates have held, on average, marginally the most jobs in Cohort 5 overall. When positional change has occurred this has largely been for internal reasons.

### 8.2.3 Non IS career stream

#### *8.2.3.1 The non-IS careers of computer science major graduates*

Overall, approximately 20% of those responding to the graduate career survey were classified in the non-IS career stream. Within the computer science major group this relates to 15% of graduates from this background.

The career focus of these graduates in the non-IS career stream, apart from the dominant focus in education or tertiary institutions has been associated with the primary degree area. In particular Bachelor of Commerce, Bachelor of Engineering, Bachelor of Laws/Science which implies bachelor degrees based in other faculties that, in the final year, included a computer science major. Tasmania has been central to the careers for a majority of these graduates and, with the exception of Cohort 1, more frequently these careers have involved working in large public sector organisations. The influence of Education Department scholarships and the subsequent teaching bonds in the earliest cohorts is evidenced by their considerable involvement in employment in medium sized public sector organisations.

This career stream has proved the least geographically mobile. The distribution of the locations in this group is very limited, with Tasmania being the major source of employment. The remaining career activity has also focussed in the larger population centres within Australia, while overseas, graduates have worked in New Zealand, the Netherlands and Sweden.

This group has also proved to have been the most stable in terms of the average number of positions making up the careers of this graduate career group, being lower across each of the four graduation cohorts on which these results are based. For this non-IS group from a computer science background, positional change has mostly been based on external career movement.

#### *8.2.3.2 The non-IS careers of information systems major graduates*

Within the information systems stream results, the non-IS career category represents just over half of the work histories obtained from the graduates making up the information systems major group in the career survey.

For this group the areas of career focus would appear to have been largely determined by the primary degree qualifications. In particular, Bachelor of Commerce and careers in accounting, finance or marketing. There were also some career areas that, due to the relatively short period involved, it was impossible to identify clearly as falling specifically into a conventional area. These graduates have spent the major portion of their positional involvement in the private sector, in particular, in small and large sized organisations. The dominant geographical location has again been Tasmania, with a clearly distinguishable gap between here and remaining the major Australian population centres and the UK. These graduates, on average, have held fewer positions as compared with the Cohort 5 average, and when they did change appointments, most often this was attributed to external cause.

### 8.2.4 Initial post graduation appointment

On the basis that the initial post graduation appointment is an integral and highly influential milestone in a career, the second research question was constructed to address the remaining four objectives established for this research, namely to:

- examine the first post-graduation career appointments of these graduates to determine the extent to which they initiated careers in the IS industry;
- determine the extent to which these graduates embarked on their careers according to business sector involvement and geographical location;
- examine the positional mobility in the initial post-graduation appointment;
- gain knowledge of the criteria graduates commonly apply when seeking initial career appointments and the reasons that underlie the decision to accept a particular position.

**Research Question 2:**
*With reference to the initial post-graduation appointment and with a particular focus on original career choice, business sector and geographic location, how did graduates approach gaining and accepting the position and what is the extent of their mobility when engaged in this role?*

The results from part two of the graduate career survey established that approximately two thirds of the graduates who responded, reported their first career appointment had involved working in an IS role. Over time, within the computer science undergraduate stream, an even higher proportion have embarked on their careers in this capacity. Conversely, a similar proportion of information systems graduates embarked on their careers in a non-IS position.

#### *8.2.4.1 The initial career experiences of computer science major graduates*

Approximately three quarters of graduates from a computer science background began their careers working in an IS appointment, a result that has continued to a similar extent in each of the four cohorts based on this undergraduate major.

Most of these graduates who have embarked on their careers in IS have worked as programmers. Slightly less of these graduates began their careers working as analyst/programmers. Apart from these two central areas of initial career focus, the IS positional roles reported by graduates over time has become more highly diverse, with many titles not found in the IS recruitment survey being reported. While for these graduates earlier teaching was the dominant non-IS role, this has not proved the case for more recent graduates. Many of the positions reported have been linked to the primary bachelor degree. For example accountant, engineer or surveyor. More unusual non-IS roles have involved employment as a chef or a croupier.

Regardless of whether the initial position was in an IS capacity or not, large public sector organisations in Tasmania have proved the dominant employer of these graduates. While the ACT was a popular destination for earlier graduates to establish their careers, more recent graduates who have relocated, have mostly moved to Victoria or New South Wales.

The University careers office was the most popular means among these graduates used to seek employment. There is also some evidence that many earlier graduates were approached by employer organisations. Graduates largely accepted their initial position because of the perceived prospects of the appointment. Against the literature (Arnold & MacKenzie Davey 1992), location proved to be secondarily the most influential criteria guiding positional acceptance decisions.

More generally these graduates remained in their initial position slightly longer than two years. According to the IS career literature the positional mobility of graduates is highest in this period (Igbaria & Greenhaus 1992b) particularly in the first year or so of employment (Martin & Shell 1988). When these graduates moved out of their initial appointment, largely this change was attributed to internal reasons. That is, they continued working with their existing employer.

#### *8.2.4.2 The initial career experiences of information systems major graduates*

Directly opposed to the results in relation to the initial appointment for graduates from a computer science major, three quarters of the information systems graduates began their careers in non-IS positions.

While overall the dominant source of employment for this graduate group has been in large private sector organisations, there has also been a significant uptake of positions in large public sector organisations. This supports the result that the dominant IS or non-IS roles reported by these graduates have been that of CSO or officer positions.

For the remainder of graduates who launched their careers in an IS capacity, there was considerable diversity of initial IS roles reported. The secondary area of involvement for graduates who began their careers in a non-IS role was based in managerial appointments. Again reflecting the primary bachelor degree, accountancy positions were more common. Apart from these outcomes, the remainder of these graduates initiated their careers in a wide variety of appointments.

Tasmania was the primary location for these initial information systems major group to embark on their careers. Alternative destinations were similar to those from other

graduate career groups with the larger Australian population centres, Victoria, New South Wales or the ACT proving to be the next most reported locations.

While this group more frequently reported using newspaper advertisements as the main source of finding their initial position, the next most commonly applied means were classified by respondents as 'other'. Graduates clearly also made an initial career decision based on the perceived prospects of the job. Location was yet again the second most often applied criteria. For those embarking on their careers in other than an IS role, it was a highly significant criteria and was considered almost equally important as the perceived prospects of the position on offer.

Against the literature, these graduates tended to remain in their initial position in excess of two years, those in the non-IS category remained marginally longer than did graduates defined in the IS group. When change did occur, for those beginning their careers in the IS industry, more frequently it was due to external career movement implying a move to a new employer organisation. While this outcome was generally much the same among those who started in alternative areas, no single cause could be clearly identified.

## 8.3 Discussion

The aim of this section is to discuss some of the issues arising as a result of this research. More specifically, this will focus on the following aspects:

- the extent to which graduates have worked in the IS profession;
- the perceived high mobility of IS personnel;
- the limited career paths in the IS profession;
- external factors;
- the regional effect;
- an insight into hybrid careers;
- patterns of organisational involvement;
- patterns of geographical career movements;
- non-IS career focus.

### 8.3.1 Extent of involvement in the IS industry

#### *8.3.1.1 Computer science major graduates*

In light of the chronic shortage of skilled IS personnel, the result that nearly two thirds of graduates holding a major in computer science have gone on to pursue careers in the IS profession is positive.

When these results are viewed over time, then within the four graduation cohorts that describe this undergraduate stream, consistently IS dedicated careers have not only dominated, but the extent of involvement has increased across the four periodic timeframes defining the computer science cohort in this research. Half of the graduate respondents making up the initial computer science major graduation cohort have reported following dedicated IS careers. Involvement in this career stream has subsequently risen incrementally across the three remaining cohorts to the extent of describing over two thirds of those graduating between 1991 and 1995.

When putting this proposal forward, however, it is necessary to acknowledge a number of issues that need to be taken into account. It could be claimed there is evidence to support that careers in IS have increasingly become a more popular career choice among computer science major graduates. However, it could also be construed that a sampling bias has been introduced because of the declared focus of this research to be in IS careers. That is, graduates who were invited to complete the graduate career survey, and involved in IS careers, may have felt more positively reinforced to participate. Conversely, graduates who have engaged in other career areas may have seen their contribution as of little relevance, and therefore less motivated to respond. While there is no way to confirm or reject that this has been the case, it is nonetheless necessary to acknowledge this situation as a potential influence to the outcome of this portion of the results.

In support of this outcome, however, it could be argued that the increasing involvement of graduates in IS careers could simply reflect the widening uptake of computers and computer technology (and hence wider career opportunities and choice and the attractiveness of promoting careers in the IS field) in the modern business environment.

#### *8.3.1.2 Information systems major graduates*

This aspect of the results also has implications for the shortage of skilled IS personnel. With the now closer alignment of technology and business, the IS industry will increasingly require people capable of supporting this widening focus (Juliff 1998).

The move to the 'Information Society' has implemented a change away from the traditionally technical orientation to one where business and people issues are now an integral component of the IS industry. The results of this research have revealed some indicators of a trend that this change is happening. In particular, the fact that graduates making up the most recent cohorts have more often reported engagement in managerial or analyst roles. The decreasing demand for programmers and increased need for IS personnel with a broader skill base, was evidenced in the IS recruitment survey results. This outcome was also reflected in the positional involvement reported by graduates from a computer science major background. That is, the reduction in the dominance of programmer positions for those in the most recent cohorts.

A much smaller proportion of information systems major graduates have taken up dedicated IS careers. However, in view of the diversity of their primary bachelor degree qualifications and, the relative recency of this undergraduate stream, this outcome is reassuring feedback for the IS industry. It is important when considering this result that some reference is also made to the employment experiences of those defined in the hybrid career stream in Cohort 5. The results for this group tend to suggest that many of these graduates, despite a desire to work in the IS industry, in the short term may have found difficulty achieving this objective. Two potential reasons that could explain this situation are the impact of tight economic conditions and the relative newness of tertiary qualifications in information systems. The fact that the careers of graduates who reported dedicated IS careers have been more evenly distributed geographically, could suggest that to follow this specific career

focus has necessitated a move from Tasmania to one of the major Australian population centres.

At the time the graduate career survey was conducted, information systems was a newly emerging stream of study and so lacked any historical or substantive links with the IS industry. This was further evidenced by its lack of recognition in the annual graduate destination survey produced by the Graduate Careers Council of Australia (GCCA 1993). Consequently, it could be proposed that graduates from this undergraduate stream lacked role models of careers in IS and also, as a foundation graduation group, have not had the benefit of contacts in the industry. As such these graduates can be regarded as pioneers in a new stream of people and business oriented professionals in this field, who represent an emerging aspect of careers in the IS profession (Keen 1988).

When information systems was initially made available as an undergraduate elective, it was not a degree in its own right. While when initially it was offered in the Department of Computer Science, this stream of study was more often viewed as an opportunity to gain computing and business skills/knowledge to enhance career prospects in other degree areas. Reflecting the emerging importance of a broader skill base in the IS industry, a School of Information Systems has subsequently been established to provide a Bachelor of Information Systems as an award.

In contrast, for the nearly three quarters of respondents who hold Bachelors of Science, these were more commonly based on a combination of computer science and mathematics majors. As these two undergraduate streams are integral components, it is likely to direct career focus towards employment in the IS industry. Consequently, the link between an information systems major and a career in IS was significantly weaker than that for graduates from a computer science background.

The limited extent of the careers contained within Cohort 5 may also be insufficient to be truly representative of the longer term career directions of these graduates. So while the results are based on up to a five year career time frame, it may well be that this data are too premature to reflect the uptake of IS careers by those qualified in this newly established area. As the broadening scope of activities progresses in the IS industry, there will be a higher demand and more opportunities for people from an information systems background. Consequently, in the near future a number of these early graduates could come to re-evaluate their initial career choices.

#### *8.3.1.3 Women graduates and careers in the IS industry*

The initial objectives of this research precluded an in-depth examination of the career experiences of women graduates. Women are generally regarded as a minority in tertiary IT courses (McLean, Tanner & Smits 1991); (McLean, Tanner & Smits 1991) and, as a consequence, in the IS industry (Igbaria & Baroudi 1995). The small proportion of work histories from women represented in the results and the dominance of male graduates in the graduate database have both reflected this situation.

An important outcome from this research is that the results have shown that relatively fewer female graduates than male graduates who embarked on their careers in IS appointments, have subsequently moved to alternative areas of career focus.

This research has therefore served to provide feedback to the IS industry and also confirmed the recognition that women represent a largely untapped human resource in working to overcome the shortage of skilled IS personnel (AIIA 1999b); (DEET 1992).

#### *8.3.1.4 The extent of loss of graduates to the IS industry*

Another related, and important, outcome of this research is that it has established that the loss of personnel who were initially employed in an IS capacity was no greater than that from those who embarked on their careers in alternative, non-IS, positions. A comparison between Figure 7.2 and Figure 7.1 clearly shows that the similarity in the extent of flow from initial appointments in IS or non-IS areas and later involvement in a hybrid career steam. So rather than implying that all those who initiated their careers as IS personnel and subsequently moved to non-IS roles were completely lost to the IS industry, the results of this research suggest considerable movements between the two areas. This is further supported by the distribution between IS and non-IS roles in the hybrid career stream which were found to have been almost equally divided.

In relation to the shortage of skilled IS personnel, the results from this research have provided some beneficial insights into the uptake of IS careers, by both computer science and information systems major graduates.

### 8.3.2 The perceived high mobility of IS personnel

One of the most commonly ascribed characteristics levelled at IS personnel is that they are susceptible to above average job mobility (Bartol 1983); (Bartol & Martin 1983); (Garden 1988); (Guimaraes & Igbaria 1992); (Igbaria & Greenhaus 1992b); (Igbaria & Siegel 1992); (Ketler 1993); (Klenke & Kievit 1992); (Kym & Park 1992) and (Tanniru & Taylor 1981). By comparison with other work force sectors they have come to be regarded as highly mobile, particularly in relation to their initial appointment. Much of this comes from the motivational IS literature based on the seminal work by Couger and Zawacki (Couger & Zawacki 1978). One of the findings from that research was that those engaged in programming and analyst appointments, have a far higher need for job challenge (defined as growth needs strength - GNS) to maintain their interest and, in turn, their services. This has lead to the view that for management they pose special problems. That is, due to the chronic shortage of skilled IS personnel, not only is it difficult to recruit suitable employees, but it can be equally problematic to maintain their motivation, and, in turn, retain their services (Roach 1995b).

At the same time these workers also face a paradoxical situation. If they remain in the same role for an extended period, they are at risk of becoming over specialised to the point where they fall behind with advancements in the rapidly changing technology. Further, if they stay in the same organisation for 8 or more years, from a recruitment agency perspective, their marketability is seriously devalued. One of the key characteristics employers seek in IS personnel is flexibility and generally an employment background of this length is counter to this prerequisite (Howarth 1996). Further, in the IS industry, after seven or more years movement across role categories can prove extremely hard (Keen 1988).

This research, based on a longitudinal and comparative approach, has shown that IS personnel are no more highly mobile than graduates working in other areas. While, on average, those following non-IS careers have reported a lesser number of positions, the differences are only marginal.

In relation to the length of time graduates remained in their initial post-graduation appointment, there is evidence to support that graduates embarking on their careers in an IS role were generally more highly mobile than those who did not. However, the application of the Wilcoxon (Gehan) test (Norusis) has demonstrated that this difference was not statistically significant. This result goes against the literature and the commonly quoted two year or less period duration of initial appointments (McGregor 1991); (Martin & Shell 1988).

Consequently, the results based on both work histories and initial post-graduation appointment are clearly against the literature and therefore offer some counter for the tendency to perpetuate high mobility as one of the key characteristics that sets IS personnel apart from other labour force sectors (Jackson 1986); (Igbaria & Baroudi 1995). In turn these leads to question whether, in fact, there is sufficient substantive evidence to support that, IS personnel as a work force sector warrant this label. As a consequence, in terms of the high mobility, this research supports those who have questioned that these workers are really different (Ferratt & Short 1988). The IS literature reviewed in this thesis has demonstrated that while there is only limited research into careers in the profession (Ginzberg & Baroudi 1988), even fewer of these studies have provided grounds to validate that this stereotypical labelling is little more than a perception.

Realistically, the acceptance that newly emerging work groups comply to a specific set of traits could simply be part of the stages of development of a profession, especially one founded on a technology that initially was beyond understanding by the general population. The alienation of early IS personnel has historically been recognised in the literature (Chandor 1976); (Friedman & Cornfield 1993). In terms of development as a profession, the Australian Computer Society was only recently been admitted into the Australian Council of Professions towards the close of 1999 (Anonymous 2000). A parallel from the literature review in this thesis has already demonstrated that at the time librarianship was emerging as a profession, the self perceptions and public image of librarians were key issues under examination in the work of Slater (Slater 1979).

The most highly mobile career group have been graduates defined in the hybrid career stream. Potentially, two factors that may have contributed to this result and suggest that mobility is not directly related to IS personnel *per se*, but a consequence of extraneous circumstances. In particular, travel and the evident desire of many graduates to remain resident in their home state. When considering the effect of these conditions on mobility, what is crucial is that the number of IS and non-IS roles reported by graduates making up the hybrid career stream, have been almost equally divided. Consequently, the outcome of high mobility cannot be substantively linked to either cause.

Essentially, two features that have emerged from the work histories of graduates making up the hybrid career group. These are the notion of 'time out' or 'stop gap'

movement in the careers of these graduates. While both will be discussed in more detail later in this chapter, here they are raised to explain the higher positional mobility within this group. From the results, a key characteristic of the hybrid career stream has been that these graduates have travelled more widely in the course of their careers, than those making up either the IS or non-IS career streams.

Consequently, the likelihood of transitory positional appointments in the careers of the hybrid career group has been higher. Although it has been evident across all the cohort groups making up the hybrid career stream, a very clear example is the results for Cohort 1. Against the common pattern for the dominance of Tasmania as the site of the majority of graduate positional appointments, the UK has proved the significant geographical location in the careers of this group. These graduates have also reported, on average, the highest number of positions compared with the overall cohort average number of positions reported. Therefore it is reasonable to suggest a relationship between mobility, travel and 'stop gap' or 'time out' positions.

Based on the fact of limited employment opportunities in Tasmania, and the considerable positional involvement of graduates in this state, it could be argued that a regional effect may have contributed to the lower mobility of those classified in the dedicated IS career stream. That is, many graduates in order to maintain a career in the state, could have been prepared to stay longer in an available position. At the same time, however, the notion of 'time out' and, in particular, 'stop gap' appointments among graduates in the hybrid career group must be taken into taken into account, if causality is to be attributed to the regional effect.

### 8.3.3 The limited career paths in the IS industry

This research has also provided some insight to the notion of limited opportunities for career advancement in the IS industry (Chesebrough & Davis 1983); (Applegate & Elam 1992); (Igbaria & Greenhaus 1992a). For the purposes of this research the classification of the career paths of graduates was attempted largely with reference to the much earlier research of Tanniru (Tanniru 1983). This established the assumption that IS career paths are not only limited, but follow fixed stages of positional progression. For example, a systems development path was defined as traditionally founded on a progression of programmer → analyst → (analyst/programmer) → project manager (Tanniru 1983).

The results based on this approach supported the dominance of systems development focussed careers and indicated that less extended careers potentially were following a similar outcome. However, the fact that a considerable proportion of graduate employment has been in large organisations could have influenced this outcome. It is highly likely that such establishments, although possibly fewer in less recent times, had the requirements and the resources to support traditional 'in house' systems development.

From both the results from the graduate career survey and the IS recruitment survey clearly show programmer and analyst roles to be the dominant areas of occupational involvement. These are the two fundamental appointments in a systems development career path. It also became apparent that over time a far greater diversity, of not necessarily mutually exclusive roles, have emerged. For example, roles such as administrator, coordinator, systems strategist or designer.

These outcomes from the research create some issues worthy of further consideration. In particular, the commonly accepted perception of limited career paths available to those seeking to follow a career entirely focussed in the IS industry and, namely the:

- viability of established career paths in the IS industry;
- descriptive accuracy of positional titles;
- emergence of the protean career.

#### *8.3.3.1 The viability of established career paths in the IS Industry*

Contrary to the perception that IS personnel are presented with very limited career paths, Keen (Keen 1988) rejected that they even existed and proposed that there were only career trajectories. This view was based on the premise that, for IS personnel, there was a distinction between tasks (what they did and the knowledge they required) and roles (how they operated). Significantly, this has associations with the considerable focus in the limited IS career research that is available on role ambiguity, role conflict and boundary spanning.

#### *8.3.3.2 The descriptive accuracy of positional titles*

The results of this research, to a large extent, have served to support this view. The IS positions reported by graduates revealed a widely diverse range of role titles. The need for more accurate and clear job descriptions has been recognised in trade publications (Anonymous 1995). In the absence of any accurate means to ascertain precisely what a specific role involved, it has been necessary to simply accept positional titles at face value. In an industry based on rapid change, it is almost impossible to keep pace with the areas of activity a specific role may encompass. Paradoxically, it also implies that these can never be established because of rapid and constant change.

Consequently, it is unrealistic to expect that common patterns will be rigidly repeated in the work histories of graduates entering the labour force at different points in time. Unfortunately, what this also may imply is that often specific expertise has gone unrecognised, denying highly skilled employees the status they justly deserved (Singer 1995). In turn this also raises issues related to role conflict, role ambiguity and boundary spanning. While these are highly topical issues in OB career research, in IS personnel research (Guimaraes & Igbaria 1992); (Igbaria 1991); (Igbaria & Greenhaus 1991), they are regarded as even more crucial to stem the perceived high mobility of its labour force.

#### *8.3.3.3 The emergence of the protean career*

While more generally graduates have reported traditional roles, this research has raised implications in light of the emergence of the protean career. It is not unrealistic to propose that in many instances the responsibilities may have gone well beyond what the positional title implied. Most importantly, in light of the emergence of the protean career (Hall 1996); (Waterman, Waterman & Collard 1994), it is becoming increasingly important that graduates are able to accurately present their unique range of expertise and experience to potential employers.

In particular, examples from the results of this research support this view. Descriptively broad positional titles such as specialist, professional or technologist may not necessarily be mutually exclusive and nor do they convey specific areas of IS expertise they potentially encompass.

As a result of this research, it is proposed that careers in the IS profession need to be conceived of as trajectories (Keen 1988), rather than a series of role progressions along a rigidly defined paths. In the face of ever developing and changing positional requirements, it is simply not tenable to attempt to lock personnel into historical job titles. A major benefit to be gained for the IS industry is that this has the potential to attract highly accredited graduates to the profession by promoting the status and range of activities in careers in this area of the labour force. The adoption of this approach in the IS industry would also represent a substantive response to one of the key recommendations of the ASTEC Report (ASTEC 1995) to address IS skill shortages.

### 8.3.4 External factors

#### *8.3.4.1 The impact of the Australian economic environment*

The impact of the Australian economic conditions in the mid 1980s had specific implications for business, the structural economic problems that emerged in Tasmania during this time and, in turn, employment opportunities for graduates. Australia entered an economic recession and the stock market in this country collapsed in 1987.

The Industry Audits (Industry Audits, 1999) has identified four major areas:

- the winding down in the 1980s of the sustained program of energy building which subsequently, in the 1990s, ceased;
- the rapid expansion phase of resource-based commodity industries of the 1960s and 1970s ceased, which necessitated a contraction of the operations of many corporations (implying also staff numbers);
- the move by a significant number of corporations to relocate and centralise their operations in other states;
- the contraction of the local economy with job shedding both in the public and private sectors (Industry Audits, 1999).

The results for Cohort 3 graduates (that is, those who graduated between 1986 to 1990) defined in the IS or hybrid career streams clearly reflect this downturn in the Australian economy. In particular, the move away from large public sector organisations and the increasing importance of medium and small private organisations as a source of graduate employment. During this period many hierarchical bureaucracies were flattened, departments combined, shut down and non core business operations outsourced.

In particular, this was highly relevant to IS functions in large establishments. An inspection of the client profiles of one of Australia's major IS outsourcing service

providers, Integrated Systems Solutions Corporation Australia (Roach 1995a), clearly establishes this to be the case and also demonstrates the extent to which this approach has been adopted by organisations that previously would have been significant employers of IS personnel. For example, the Department of Education, Employment and Youth Affairs, Optus Communications, Telstra, VicRoads and the Public Transport Corporation of Victoria.

Many former IS personnel who were prematurely forced into retirement through redundancy as a result of outsourcing or down sizing, formed business alliances and established their own business operations. Support for the emergence of small and medium enterprises (SMEs) comes from a very current government report (DCITA 1999a). This recognised the national strategic importance of SMEs in general, but more especially those based in the IT and T industry. Over the last twelve years these have experienced a rapid growth to the extent that between 1990 and 1996 this represented treble the rate of the national economy. In contrast, over the same period the rise in the manufacturing industry was only 15%. What needs to be emphasised here, is that while generally there has been growth in all business areas, the exceptional growth was limited to SMEs in the ITandT industry.

In relation to the downturn of the Australian economy in the mid1980s the results of this research suggest that during this period stable career appointments have been more difficult to find and employment has often necessitated travel to other destinations. Graduates in Cohort 3, especially those classified in the hybrid stream and, to a lesser extent, in the IS career streams, have reported a greater diversity of roles and geographical locations. These results support the notion of 'stop gap' career appointments within the hybrid career stream which will be considered later in this chapter.

There is some indication that economic conditions also may have, in part, contributed to the different outcomes for information systems graduates, in particular those reporting dedicated IS careers. While they have been a pioneer group in so far as establishing careers in the business community, the results for these two career streams reflect those for Cohort 3. In particular, a considerable proportion of the career activity for these graduates has been in the private sector. To maintain positions in IS, of necessity it would appear that many of these graduates have travelled to New South Wales or Victoria. Once employed they have also tended to remain with their existing employer organisation, as evidenced by the dominance of internal career movement in this cohort career stream. To a lesser extent, the effect of economic conditions has also been apparent in Cohort 5 graduates defined in the hybrid career stream. The diversity of non-IS roles this group have reported, could suggest that many graduates from an information systems background with long term IS career goals may have experienced some difficulty obtaining positions in the area.

The results of this research reflect the downturn in the Australian economy and more specifically its impact on the careers of Tasmanian graduates. While previously there has been a heavy reliance on large public sector organisations in this state as a source of employment, there is evidence to support that employment opportunities in this sector have contracted. The results have also indicated the increasing importance of small and medium private companies in the careers of more recent graduates. In view of the obvious preference of many graduates to remain in Tasmania, a positive

outcome of this trend is the current move to inject considerable funding into the economy to promote the development of IS centred businesses in the state (DCITA 1999b).

#### *8.3.4.2 The broadening skill base in the IS industry*

Another significant change observed in the results of this research was a tendency of a move away from programming, both for more recent graduates and on the part of employer organisations. This outcome is not seen as working towards the fulfilment of the forecast in the 1970s that there would be a decline of programmers in the IS industry almost to the elimination of the role (Kraft 1977). Rather, it is proposed that this change has been primarily been driven by economical considerations and also the widening of the activities within the IS industry. In a more stringent economic climate it is realistic that organisations have increasingly sought to appoint people with multiple analyst/programmer skills. Based on economies of scale, this has maximised the contributions of a new employee to the company.

The decrease in dedicated programming appointments could also have been indicative of the changing nature of IS in the modern business environment. While technology has remainder as an one of the key underlying activities, the fact that IS is increasingly becoming an integral component to support the core goals of organisations, has necessitated that IS personnel represent a broadened skill base.

### 8.3.5 The influence of the regional perspective

It is necessary to point out some unavoidable influences because this research is based on a graduate sample from the Department of Computer Science at the University of Tasmania. However, while it is considered essential to acknowledge this situation, it does not mean to convey the message of a defence as to the quality of the results obtained in so far as meeting the prescribed objectives of this research.

It is freely acknowledged that this research represents a regional perspective. However, while it has been reported earlier in this thesis that just under 60% of the mail out of the graduate career survey was directed within this state, the bigger picture also needs to be considered. That is, while the graduate database contains the records of 859 graduates meeting the criteria for inclusion in this research, over one quarter of these proved to be either impossible to trace or else represent returns as 'address unknown' when the career survey was administered. Obviously, this unknown geographical distribution has the ability to change the representative balance if, in fact, all or even a greater proportion these graduates could have also been contacted and included. Based on an assumption that the chance of locating graduates resident in the state must be higher than the possibility of tracing those now living further afield, it is reasonable to suggest many now live outside Tasmania.

There is, however, a counter viewpoint that in fact a regional perspective of the work experiences of graduates is highly relevant. The results from the graduate career survey confirmed the literature that in Australia, Victoria, New South Wales, and to a lesser extent, the ACT are the dominant centres of employment in the IS industry. Consequently, it can be argued that for smaller population centres, where often there are only limited employment opportunities, career research is even more highly

relevant. Given Tasmania's dire economic standing (Bell 1997) this is especially true.

The considerable long term involvement of many earlier computer science graduates in programming appointments could be indicative that conscious decisions to remain in Tasmania may have limited opportunities for career advancement. The dominance of large public sector organisations, up to the mid 1980s, with their inherent hierarchical system of career progression could have significantly influenced the career outcome for many of these graduates. However, it could simply be that many of the longstanding IS careers founded on programming roles imply that a number of earlier graduates were technically oriented and reinforced to remain working for an extended period in this capacity.

### 8.3.6 An insight into hybrid careers

For the purposes of this research, the identification of this particular career stream does not follow that normally adopted in both general and IS literature (Kaufman 1974); (Chesebrough & Davis 1983). That is, conventionally it is based on describing the movement between technical or managerial focussed careers. This notion of a dual career path is more generally of concern because it is seen as placing those involved at a serious risk of losing the technical edge in their expertise. That is, because they are no longer directly involved with technology, not only are they susceptible to lose their basic and accumulated skills, but also are at risk of falling behind with recent advancements. In relation to the computing industry, which is based on rapid and ever developing innovation, the realities are that this problem could be accelerated and even more crucial.

At the same time, however, there is a further dilemma making the situation paradoxical. That is, it is acknowledged that professionals do not readily accept being directed by people in management who do not hold at least equivalent, or higher, expertise in the specialised field of involvement (Martin & Shell 1988). This also is obviously highly pertinent for knowledge (IS industry) workers.

In this research the classification of the hybrid career stream does not follow the traditional division. To gain a realistic and holistic insight into the career experiences of these graduates, an open approach was used. Importantly, this assisted the continuity of recording in the work histories and so aided the accuracy in human memory recall, which is a key issue in retrospective data collection. Consequently, respondents to the graduate career survey were required to list all the appointments making up their careers and also to indicate whether or not each position represented an IS role. Obviously, those work histories that contained a mix of yes and no responses provided the basis for classification into a hybrid career stream.

Although this aspect of the results do not meet the criteria to be classified as dedicated IS careers, when the areas of role involvement are considered, it does raise a number of issues worthy of further consideration. Given that this stream of career describes approximately one quarter of the overall responses to the graduate career survey, then this aspect of the results is an essential consideration when looking at the extent of the IS career involvement of these graduates. An additional statistic that also supports the inclusion of this portion of the results is that of the total of the 288

appointments involved, the division is almost equal between those classified as IS focussed and those not.

Most importantly, what becomes clear from this portion of the results is that, based on the work histories of these graduates, these may not necessarily represent a loss to the IS industry. Here the main issue is that basically non-IS appointments can be grouped as due to two circumstances. Firstly, these could simply represent 'stop gap' measures to maintain an income while between IS career goal oriented appointments. Secondly, and not necessarily mutually exclusive, it could also reflect 'time out' in a career. These issues are further discussed in the sections to follow.

#### *8.3.6.1 Stop gap career appointments*

There is evidence in the results to support the notion that some of the appointments graduates reported can, in fact, be described as 'stop gap' and subsistence motivated. This is clearly evidenced when the outcome for the distribution of non-IS positions is considered (Table 7.3), where unanimously, meaning both overall and across time, the 'other' classification is the highest quantifiable result. While this demonstrates that a great diversity of positional titles are involved, as noted in Chapter Five many would not require academic qualifications. For example, clerk, builder's labourer, dairy hand, fruit picker, mechanic, operator and waiter. In addition, and perhaps with slightly more role status, are positions working as a masseur or a translator/proof reader. In so reporting this outcome it needs to again be stated these roles do not represent an initial potentially interim career appointment. Within this research, as explained in Chapter Four, initial post-graduation appointments of this nature have been purposefully eliminated from the results.

The notion of 'stop gap' appointments gains further support when the outcome of role involvement for the most highly geographically mobile Cohort 3, is considered. These results showed that nearly half of the non-IS roles reported by this group fell into the 'other' category. In comparison, for the four remaining cohorts this figure varied from one quarter to just over a third of the appointments making up this classification. From these results it is reasonable to predict that in many graduate work histories, in order to fund the cost of travel and living, graduates have been prepared to accept any available position.

Consequently, in relation to 'stop gap' career appointments, from the issues raised above, it is apparent that not all the work histories making up the hybrid career group necessarily represent a loss to the IS industry. At the same time however, it needs to be recalled that in relation to the initial post-graduation appointment, this situation was pre-empted. As a result in the design of part two of the graduate career survey, through the inclusion of the reasons why this first appointment was accepted, it was possible to identify such cases and eliminate bias in the results in this data subset.

#### *8.3.6.2 Time out career appointments*

The view that hybrid careers do not necessarily represent a loss to the IS industry, is further supported by considering the potential influence of the second reason proposed earlier, circumstances of 'time out' in a career. While 'stop gap' positions can be taken to also be 'time out' situations, the point that is being made here is that a professional career can also involve multiple and parallel career streams. This serves to highlight both the flexibility in work opportunities available to graduates

with this academic background and, as a consequence, the development of a wider skill base. Potentially this could be the case within some of the work histories classified in the hybrid career stream and so raises further issues for consideration.

In relation to career flexibility, and the notion of dual career paths, then this is clearly demonstrated in the results for graduates with bachelor degrees in surveying, accounting or engineering whose career histories are classified in the hybrid career stream. This indicates that these graduates have worked both in the area of their primary degree focus and, at times in their careers, have also professionally applied their IS qualifications. It is reasonable to assume that in some cases this could have involved acting as a facilitator between the introduction of information systems into a range of occupational areas. What is important is that graduates who have worked in this multiply focussed career can stand out in the recruitment process. An applicant who presents with a broader skill base, spanning occupational and technological areas, must be perceived as a more desirable human resource acquisition.

Further, the advantages of having a wider skill base extend to other graduates beyond these three degree areas. Many of the successful managers interviewed during the seminal work of Smits, McLean and Tanner reported having engaged in hybrid careers (Smits, McLean & Tanner 1997).

To summarise, this portion of the discussion has focussed on the extent to which these graduates have pursued dedicated IS careers. It has also raised some positive outcomes and interesting insights. In particular, the fact that over half have continued to follow this career course must be an outcome that will be welcomed by the IS industry. Further, when the positional make up of the hybrid career stream results were considered, in light of 'stop gap' and 'time out' positions, then potentially the initial distribution of dedicated IS careers could be even higher. Finally, in view of the emergence of the protean career (Hall 1996) described in Chapter Two, it is possible that those reporting hybrid careers may in fact have gained advantages for their long term career outcomes.

### 8.3.7 Patterns of organisational involvement

While patterns of organisational involvement have become evident in the outcomes from this study, it is proposed that these have been largely driven by the influences of the regional perspective and also the effect of the economic recession in Australia.

In relation to the first of these factors, the regional perspective, the recently announced BITS initiative (DCITA 1999b) has a potentially positive outcomes for graduates wishing to maintain careers as IS professionals and, at the same time, to remain in Tasmania. To recap, the BITS will inject $40m. into the state for the purposes of the development of core business operations based on IT goods and services. The implication of the economic downturn is of particular importance in view of the emergence of the protean career, and the increasing trend for a move away from a long term contractual career arrangement between organisation and an employee.

### 8.3.8 Patterns of geographical career movement

Based on both the work histories and initial post-graduation appointment, the results from this research go against the commonly held view that employment necessitates an exodus of graduates from Tasmania. Significantly, this outcome holds true regardless of career involvement.

An unexpected outcome of this research was the considerable career involvement of these graduates in Tasmania to an extent of representing nearly two thirds of the positions making up the careers of respondents to the graduate career survey. This finding is more remarkable because it extends across the whole twenty year period of the study. It also holds true for both the initial post graduation appointment and work histories reported by graduates. While this outcome is clearly linked to a regional effect in that it goes against both the literature and the results from the IS recruitment survey, it does challenge the commonly held perception of the considerable exodus of graduates from Tasmania.

Clearly, the results from the second research question where respondents indicated the criteria they applied when deciding to take up an initial career appointment, support that many graduates prefer to remain in Tasmania. While overall the dominant response was that of perceived career prospects, the second most frequently applied determinant was location. This result is contrary to that from the comprehensive study focussing on new graduates conducted by Arnold and MacKenzie (Arnold & MacKenzie Davey 1992), which found location to be the least important factor new graduates apply when deciding position acceptance.

Graduates who have relocated have largely done so to the major Australian population centres: Victoria, New South Wales of the ACT. Within Australia, this result is in line with the literature that these three areas are the major sources of IS employment (Cameron 1991). Given that IS is an integral component of business, it is not unreasonable to suggest that this situation will also describe the central focus of employment opportunities for graduates regardless of career area. Further, the results from the IS recruitment survey, with the exception that the ACT, support the importance of these locations in providing extensive employment opportunities for graduates intent of pursuing an IS career. However, a variation in these results is that more employment opportunities were advertised in Queensland than the ACT. Admittedly, as has already been suggested earlier in this thesis, this could be simply be due to the fact that much of the recruitment in the national capital is offered in government published gazettes.

The outcome in relation the considerable career involvement of graduates in the UK can reasonably be explained in that many earlier graduates were most likely the first generation children born to people who, post war, migrated from England, and so have a greater incentive to travel to that destination to work and meet with members of their extended family.

The earlier discussion in relation to 'stop' gap and 'time out' career appointments adds to the view that many graduates have chosen to remain in Tasmania. Given the large involvement of computer science graduates in programming, it could also be that many graduates are prepared to face limited career advancements to stay in the state.

The results of this research have provided convincing evidence that many graduates have preferred to remain in Tasmania and that a proportion of those who did relocate in time have returned to the state.

### 8.3.9 Non-IS career focus

One of the stated benefits of this research was that while the primary focus was on the IS industry, it also considered where graduates who have been lost to the industry pursued careers. Obviously, this has provided an opportunity for feedback in view of the chronic shortages of skilled IS professionals.

The confirmation of the influence of the primary bachelor degree and subsequent future careers of graduates was not unexpected. What this has provided was an opportunity to compare the extent of career movements both out of IS careers and that based in alternative, non-IS areas. This has served to determine that the loss of those initially engaging in IS careers has been no greater than graduates who have been employed in other areas. This result has also demonstrated that a broader undergraduate course structure offers greater career flexibility.

While the outcome for graduates from a computer science or information systems background who have maintained careers in non-IS areas could be perceived as a negative outcome for the IS industry, this may not necessary be the case. From this broader background essentially they could act as an interface between the computer illiterate and the compelling thrust to move into the 'Information Society'.

### 8.3.10 Limitations

Two potential limitations within this research need to be acknowledged. Firstly, when following the prescriptive process as established in the analytic frameworks, in some perspectives the sample size was reduced to only a small number of graduates. While this could be criticised as a limitation, it can also be argued that the results for the most longstanding careers of the earliest graduates have represented an important contribution to this research. The inability to trace a larger number of foundation graduates from the Department of Computer Science made this outcome an unavoidable outcome in this research.

Secondly, this research could also be construed as having a regional bias. While it is necessary here to acknowledge this as a potential limitation, the influences of a regional sample have already been discussed in section 8.3.5.

## 8.4 Summary

The application of the two research questions posed in this thesis has been successful in gaining a considerable insight into the career patterns of computer science or information systems major graduates. In particular, addressing these questions has served to:

- determine the extent of both the uptake and continuance of careers in the IS industry. In view of the chronic shortage of skilled IS personnel, this aspect of the results represents an important component of this research;

- differentiate the outcomes between computer science or information systems majors and the extent of careers in the IS industry. The results have provided tangible evidence of a strong relationship between Bachelor of Science degrees and subsequent careers as IS professionals. In contrast, possibly due to the relative recency of information systems as an undergraduate major, this research has revealed only a weak association with this stream of tertiary study and careers in the IS industry;

- identify the patterns of positional role involvement of graduates whose careers have intermittently been based on employment as IS personnel;

- examine in detail the range of roles reported in the work histories of graduates defined in the hybrid career stream. This has given rise to the notion of 'time out' or ''stop gap' appointments and strong support that such employment involvement does not necessarily represent a loss to the IS labour force;

- follow through on the career outcomes for graduates pursuing non-IS careers;

- classify the career outcomes for these graduates according to one of three potential paths. This has subsequently provided the opportunity to test the ascribed characteristic of the above average career mobility of IS personnel;

- apply a structured, analytic framework to enable a multidimensional comparison of the career patterns of graduates pursuing IS, non-IS or hybrid career paths;

- challenge the generally accepted characteristic of above average mobility in the IS labour force. The results of this research, both in relation to the initial post graduation appointment and work histories making up the careers of these graduates support this stance;

- demonstrate the effect of external factors and the changing patterns of employment opportunities for graduates. In particular, this result relates to the emergence of small and medium sized private sector organisations as becoming increasingly significant sources of employment opportunities for graduates;

- suggest that the notion of IS career paths need to be redefined and that, following Keen, (1988) more appropriately, careers in the IS industry should be seen as a series of trajectories. The rapid and ever changing technological advancements and widening scope of IS in modern businesses along with the modern, protean approach to a career, support this view;

- demonstrate that a considerable number of graduates from the University of Tasmania prefer to remain in their home state. To achieve this objective, many have been prepared to accept discontinuous or limited careers in the IS industry.

## 8.5 The perceived benefits of this research

In summary, some positive benefits for career research have emerged as a consequence of this study, it has:

- in the face of the paucity of comprehensive IS career research, this research has established a foundation to enable and promote future studies in the area;

- served to demonstrate that a longitudinal approach is essential to gain knowledge of a career as a dynamic process;

- provided an example that retrospective longitudinal research, effectively applied, has advantages when applied in career research. In particular, it is not susceptible to loss of initial respondents (so enabling comparative analysis of career outcomes), it is also a cost effective, efficient means of collecting continuous data;

- shown that the major criticism often associated with retrospective longitudinal research, the accuracy of human memory recall, with careful design, can be minimised;

- provided a working example of the use of framework to guide data analysis. In comprehensive career research it is essential to adopt a structured approach;

- served to highlight that when comparisons are to be made between groups, to be truly relevant the results need to be based on a sample population sharing a common foundation bench mark. In the case of this study this was achieved through the common basis of an undergraduate major in either computer science or information systems;

- demonstrated the application of event history analysis as an appropriate means of addressing censored and uncensored data in relation to positional duration;

- provided an ideal opportunity to test the commonly accepted view of IS personnel as a unique labour force sector. In particular their ascribed characteristic of being more highly mobile than personnel in other work sectors;

- demonstrated that external factors, in particular economic conditions, have a considerable effect on careers.

## 8.6 Contributions

This research is considered to have achieved the objectives in relation to contributions, both practical and theoretical, to knowledge proposed at the beginning of this thesis.

### 8.6.1 Practical applications

Because of its practical nature this study will provide a widely applicable source of information previously not available. This reflects the view of Slater (Slater 1986) cited earlier in this thesis, that, regardless of profession, any study of career patterns and mobility is widely applicable. More specifically from the research reported in this thesis it is proposed that it has:

- provided a comprehensive source of career information not previously available. Even further, in view of the dearth of IS career research it fills a widely recognised, but seldom addressed, gap in knowledge;

- served to promote IS careers through the provision of career information primarily focussed on the IS industry. In view of the chronic shortages of personnel this is seen as making a number of direct practical contributions.

In particular, it has:

-served to ascertain the extent of the career of involvement of this graduate group in the IS industry whether pursuing dedicated IS careers or intermittent employment in an IS capacity;

-demonstrated the flexibility of careers from this tertiary background and the ability of such graduates to maximise their career prospects by having the advantages of a multiple skill base. In turn this also supports the emergence of the protean career;

-provided a foundation of comprehensive IS career research, to established a basis for future work into the experiences of women in IS careers;

-provided a source of reference to encourage university entrants to enrol in streams of study relevant to the IS industry. At the same time it provided feedback the University of the career experiences of past computer science and information systems graduates;

-adopted a holistic approach rather than looking at a specific career group, or examining work experiences in particular organisations. It examined careers based on a fundamental tertiary level benchmark which has served to allow accurate and realistic comparative analysis;

- provided feedback to the Tasmanian government in support of the BITS (DCITA 1999b) initiative. In particular it has demonstrated the high reliance on of graduates on large public sector organisations especially for initiating their careers;

- highlighted that if the Tasmanian government is to be successful in establishing Tasmania as the 'intelligent island' it needs to support and nurture the growth of medium and small IS SME businesses in the state;

- offered graduates some insight into the career outcomes of those who made a purposeful decision to remain in their home state.

### 8.6.2 Theoretical contributions

The second outcome from this research is that it builds theoretical knowledge in a number of areas. In summary it has:

- provided a synthesis of general career theory, and as such, it has established a framework to provide a basis to both encourage and guide future career research;

- demonstrated the benefits in an emerging area of research in drawing on the literature from other fields (Myers 1991);

- responded to the call for longitudinal career research (Sonnenfeld & Kotter 1982) and, at same time, it has clearly demonstrated the advantages of knowledge insight that can be gained from its application;

- provided some insight into an effective means of minimising inaccuracy of human memory recall associated with longitudinal retrospective data collection. These were the application of a milestone stimulus: the initial post-graduation appointment and also the chronological order of data collection using the analogy of a curriculum vitae;

- contributed towards addressing the problem of a worldwide dearth of empirical IS career research;

- provided foundation research of historical importance mirroring a considerable portion of the emergence of IS as a profession in Australia. In view of very recent acceptance of the Australian Computer Society into the Australian Council of Professions (2000) this research is also of historical importance;

- demonstrated the application of a comparative framework to encourage future research to adopt multiple perspectives of analysis and also how to effectively handle differing lengths of work histories in career research;

- established the need to recognise and overcome the problem of bias when handling censored and uncensored data. Even though this is an important issue to achieve quality research, few if any, examples of the application of event history analysis were found in the career research literature reviewed in the course of this study;

- questioned the generalisation of IS personnel as a highly mobile labour force sector based on a comparison of career outcomes from a benchmarked sample;

- constructed evidence, due to the wide diversity of IS positional roles reported by graduates, that work histories of IS personnel should be seen as trajectories rather than attempting to define rigid career paths.

## 8.7 Future research

The potential for research stemming from the research reported in this thesis, is seemingly unlimited. As foundation research with a major focus in dominant area of careers in the emerging 'Information Society', it has established the opportunity for considerable work both by the author and from others motivated to work in the area.

The data obtained as a consequence of this present study affords ample opportunity for further work. The decision to observe economies of scale and collect data not projected for immediate application in this study also offers the ability to extend areas of interest that have arisen as a result of this foundation study.

Ultimate outcomes of this future research will make a substantive contribution to the limited availability of IS career research and, in turn promote work in the area. Some areas this could include would be to:

- follow through on this foundation research to examine and compare the career experiences of male and female graduates. While gender was outside the scope of this foundation research, now this has been established, there is now the opportunity to pursue this aspect;

- further examine the work histories to explore for common patterns of employment in public sector organisations;

- determine if there are any common patterns of the timing of career moves out of the public sector;

- further examine geographical mobility to determine the extent to which expatriate graduates return to the state. The success or failure of the BITS (DCITA 1999b) initiative could hinge on the availability of highly skilled IS personnel both as role models and mentors to build a viable IT labour force;

- compare the career experiences between graduates who remained in Tasmania and those who relocated to other destinations. This would follow through on the notion that many graduates who have opted to remain in their home state have accepted limited career opportunities;

- examine career movement between organisations based on initial post graduate position and subsequent appointment;

In addition, it would be a worthwhile exercise to establish a data set of information systems graduates of what would constitute Cohort 6, to extend and further compare the career experiences of these graduates.

To fulfill the objective to provide career information focussed in the IS industry, it is proposed to write a report based on this research. In particular, this will be distributed to the human resource agency consultants who expressed an interest in the findings. A copy of this will also be provided for reference by the Tasmanian State Government.

For others who may be motivated to take up some of the issues raised in this research, an obvious and worthwhile activity would be to replicate this research in a cross country comparison.

Finally, this research has been highly constructive as it has challenged preconceived, stereotypical notions of the personnel and careers in the IS industry. The in-depth examination over an extended period of time, of the actual work histories of graduates, has provided a realistic insight into their practical experiences and the patterns of movement underlying their careers.

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# Appendices

## 1. Recruitment agency survey

(reduced from A4 original)

**Position vacancy information sheet**
Please complete ***one sheet*** of ten questions *for **each** computer science/information technology* vacancy registered:

**1. Organisation Type** *(Tick one category)* Private ☐ Public ☐ Government ☐

**2. Organisation Category** _____
*(refer to industry sheet see over)*

**3. Organisation Size** *Approx. number of employees (Tick one category)* < 50 ☐ 51 -200 ☐ > 200 ☐ Don't know ☐

**4. Position Title** _____

**5. Position Description** _____

_____

_____

**6. Status of Position** *(Tick one category)* Contract ☐ Temporary ☐ Permanent ☐

**7. Essential Qualifications** _____
*Please list (key words OK )*

_____

_____

**8. Preferred Qualifications:**
*Please list (key words OK )* _____

**9. Position Incentives** _____
*Key words followed by a little more detail please-* _____
*What does this position offer the prospective employee:* _____
*(for eg, but not limited to career path, training, salary etc.,)*

**10. Comments** _____

## Recruitment agency survey (over side)

**Notes:**

**1. Question 2. Organisation Category:**

The following list is a ***guide only*** if the industry of the prospective employer organisation is other than specified here please simply describe the main focus of the business.

**Manufacturing**
Basic Metal Products
Chemical, Petroleum and Coal Products
Clothing and Footwear
Computer Software Manufacturing
Computer, Peripheral, Equipment Manufacturer
Electrical, Electronic Component Manufacturer
Fabricated Metal Products
Food, Beverage, Tobacco
Industrial Machinery and Household Appliances
Leather, Rubber and Plastic Products
Printing, Publishing
Textiles
Transport Equipment
Wood Products
Other Manufacturing

**Finance**
Banking
Insurance
Non-Bank Finance
Real Estate
Trustees
Other Finance

**Services**
Architectural, Engineering and Building Consultants
Business, Professional and Labor Associations
Communications
Computer Services- Bureau
Computer- Software Services
Education
Entertainment
Health
Hotels, Restaurants and Clubs
Legal
Management Consulting
Public Accounting
Sport and Recreation
Welfare, Charity and Religious Organisations
Other Computer Services
Other Services

**Other**
Agriculture
Construction
Electricity, Gas and Water
Mining and Exploration
Public Administration
Trade - Retail
Trade -Wholesale
Transport and Storage

**2. Question 4. Position Title:**

The following list is a ***guide only*** and position title titles are not limited to the following list, however information from vacancies for data processing keyboard operators/ supervisors is ***not*** required for this study.

Chief executive, computing
General Management, including computing function
I.T. Manager
E.D.P. Manager
Systems Manager
Programming Manager
Systems and Programming Manager
Data Base Manager
Project Manager
|Systems Supervisor
Project Leader
Systems Analyst
Programmer
Programmer/Analyst
Systems/Software Programmer
Data Base Analyst
Data Base Administrator
Data Base Programmer
Telecommunications Analyst
Telecommunications Programmer
E.D.P. Auditor
Computing/IT Research
Sales/Marketing Computing
Computer/ IT Consultant

## 2. Recruitment agency results

| Results Human Resource Survey: | |
|---|---|
| | **Frequency** |
| **Question 1: Organisation type:** | |
| Private | 31 |
| Public | 1 |
| Government | 7 |
| | |
| **Question 2: Organisation category:** | |
| Business | 1 |
| Electronic | 9 |
| Finance | 3 |
| Gaming | 1 |
| Management | 6 |
| Petrol manufacturing | 2 |
| Public administration | 1 |
| Retail | 2 |
| Services | 3 |
| Service - communications | 1 |
| Software | 8 |
| Tourism | 1 |
| | |
| **Question 3: Organisation size:** | |
| < 50 | 10 |
| 51-200 | 16 |
| >200 | 11 |
| Don't know | 2 |
| | |
| | |

**Question 4: Position title:**
Multimedia director
Customer service rep
Training manager
Computer sales consultant
IT manager
Computer consultant
Network/PC/support/administrator
Computer programmer
Unix and Novell technical support
Gupta SQL Windows analyst programmer
Technical writer
System administrator
Systems consultant
Unix/Ingres analyst programmer
Gupta analyst/programmer
Senior analyst programmer/team leader
Project manager
Analyst programmer
Sales/marketing computing
Computing IT research
Graduate programmer
Top end Computer IT consultant
Management consultant
IT consultant
Computing IT research
General management
Sales/marketing computing
Systems manager
Programmer
LAN specialist
Software engineer
Embedded software engineer
Embedded software team leader
Embedded software engineer
Analyst programmer
Software team leader
Senior software engineer
Programmer
IT systems manager assistant

| **Question 5 Position Description -** | |
|---|---|
| **Key words** | **Frequency** |
| Analyse | 2 |
| Consult | 1 |
| Deadlines | 1 |
| Design | 1 |
| Develop | 17 |
| Document | 4 |
| Implement, install | 2 |
| Lead | 1 |
| Liaise | 1 |
| Maintain | 4 |
| Modify | 1 |
| Market | 3 |
| Programme | 4 |
| Support | 7 |
| Supervise | 3 |
| Team | 2 |
| Test | 2 |
| Train | 4 |
| **Question 6: appointment status:** | |
| | **Frequency** * 1 response OR added: 2 chosen |
| Contract | 19 |
| Temporary | 1 |
| Permanent | 20 |
| **Question 7, 8 Essential and preferred qualifications** | |
| Business | 2 |
| Degree | 28 |
| Experience | 6 |
| Hardware | 6 |
| Industry | 1 |
| Membership | 2 |
| Network | 6 |
| Pressure/meet deadlines | 2 |
| Program | 9 |
| Presentation | 3 |
| Retail experience | 3 |
| Software experience | 20 |
| Technical experience | 1 |
| **Question 9: Position incentives** | |
| Career | 9 |
| Car parking | 1 |
| Challenge | 4 |
| Environment | 1 |
| Facilities | 1 |
| Finance (other than $$) | 12 |
| Job satisfaction | 3 |
| Organisation | 3 |
| Performance incentives | 3 |
| Possibility of permanency | 4 |
| Responsibility | 5 |
| Salary | 11 |
| Security | 1 |
| Training | 9 |
| Travel | 1 |

**3.Collection sheet IS recruitment survey**
(reduced original A3)

| ref no | date | title | category | status | description | quals | requirements | experience | personal attributes | incentives | organisation | location | advertiser | industry |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | |
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## 4. Coding scheme IS recruitment survey

1• Advertisement reference number
- unique id number

/ Source - newspaper
- The Australian, Age or Mercury

2• Date of advertisement
- mmm/yy

3• Position title
category
status

4• Position description

| Code | Key word |
|---|---|
| Ref no | ad id number |
| source | newspaper |
| date | mm/yy ad appeared |
| title | position title |
| category | category of position |
| status | status of position |
| D0 | description default=0 yes = 1 |
| Das | assist, advise, liaise |
| Da | analyse, problem solve |
| Ddc | document |
| Dd | design |
| Ddv | develop |
| Dev | evaluate |
| Dip | implement, install |
| Dmd | modify |
| Dm | maintain |
| Dn | network |
| Do | optimise |
| Dother | other description |
| Dkw | key words from 'other' |
| Dpg | program |
| Dpl | plan |
| Dsl | select |
| Dsv | supervise, responsible, lead |
| Dt | test |
| Dtm | team |
| Dtr | train, user support |

**5. Required qualifications**

| Code | Key word |
|---|---|
| Rq0 | qualifications stated as a requirement |
| Rqde | degree essential: d, wd, da |
| Rqdd | degree desirable: do |
| Rqdp | diploma: dp, odp, dpa |
| Rqdpa | diploma as an alternative to a degree: dodp |
| Rqcat | area of qualification required if given in ad |
| Rqm | membership |
| Rqc | certificate |
| Ramccat | area of membership/certificate if given in ad |

**Required qualifications/experience**

| Code | Key word |
|---|---|
| Rxp0 | experience as a requirement |
| Rxay | experience average number of years if given in ad |
| Rxenv | experience requirements in a specific environment |
| RDB | database |
| RHW | hardware |
| RSW | software |
| RL | language |
| RL4gl | *4gl* |
| RLa | *assembler* |
| RLb | *basic* |
| RLc | *C* |
| RLcpp | *C++* |
| RLf | *fortran* |
| RLmc | *machine code* |
| RLp | *pascal* |
| RLpl1 | *PL1* |
| RLrpg | *RPG* |
| RLvb | *visual basic* |
| RLother | language, other |
| RLKW | key word |
| RNW | network |
| RSD | system development |

**Personal attributes**

| Code | key words |
|---|---|
| Pa0 | personal attributes as a requirement 0 = no, 1 = yes |
| Paa | age as a position requirement |
| Pakw | age key word or number |
| Pabs | business knowledge |
| Pip | communication interpersonal skills |
| Pam | motivation, drive, autonomy, initiative, flexible, challenge, responsibility |
| Pams | management skills, leadership, project management |
| Pao | pers.req. other |
| Pakw | personal attributes other, key words |
| Paps | problem solving/analytic |
| Patm | team member |
| Pats | technical skills |

**Position incentives**

| Code | Key word |
|---|---|
| I0 | incentives offered with this position, 0 = n, 1 = yes |
| I$ | salary offered as an amount (range averaged) |
| Ic | career path, promotion |
| Ie | work environment, tech, challenge, location, organisation |
| If | financial: bonus, housing finance, insurance, super, health benefits |
| Ikw | other key words |
| Io | incentive - other |
| Isax | attractive, excellent salary |
| Isen | salary = exp, negotiable |
| Itr | training |
| Itv | travel |
| Iwc | working conditions, flexible work hrs, rdo, facility conditions |

**Organisation**
name
type
**Location of position**

| Code | Key word |
|---|---|
| L0 | none given |
| L1 | ACT |
| L2 | New South Wales |
| L3 | Victoria |
| L4 | Queensland |
| L5 | South Australia |
| L6 | Western Australia |
| L7 | Tasmania |
| L8 | Northern Territory |
| L10 | Outside Australia |

**Advertisement placement**
d- direct advertisement by organisation
c- organisation represented by consultant
**Industry**
open coding

**5. Graduate career survey**

**The Career Paths of Computer Science and Information Systems Graduates**

**About the attached survey:**
This survey has been designed to be simple and easy to complete so that it takes as little as possible of your valuable time. Based on the pilot survey it should not take more than 15 minutes to complete. It will be greatly appreciated if you can return the completed survey by **Friday 17th July, 1997**. A pre-paid return postage envelope is included, or if you are outside Australia, an IRC (international reply coupon) is provided to cover return airmail postage.

All completed and returned surveys will be automatically entered into a draw for a University of Tasmania memento: read the enclosed pamphlet for details.

The survey is divided into two sections.

- **Part One:** The aim of this section is to obtain a summary of *all* positions you have held throughout your occupational career since you graduated. This includes any work as a contract employee and also as a self employed business proprietor.

The first page of this section gives detailed instructions how to complete this part of the survey and also provides examples of two possible positions described in terms of a career working history.

- **Part Two:** This comprises a brief survey containing questions about your initial position following graduation. Your responses are important as they will contribute to an insight into the initial employment experiences of graduates. Therefore, even if you cannot recall exactly the information required, please respond using your nearest approximation.

***It is important to note that the survey is not limited to computing professional positions. The aim is to gather information with reference to ALL positions you might have held during the course of your working career since graduating.***

The back of this page has been kept blank to enable you to provide feedback arising from your own career experiences that you consider significant and of interest to this research. Your comments will be most welcome.

The information you provide within this survey will remain confidential. Student ID numbers will be used to allow administration of the survey. The research has received ethical approval from the University Ethics Committee (Human Experimentation). If you have any concerns of an ethical nature or complaints about this project please contact Dr. Margaret Otlowski (Acting Chair), Department of Law, (03) 6223 1987 or the Secretary (Chris Hooper), Office for Research (03) 6220 2763.

Questions related to the study are welcome and can be directed to Dr. Chris Keen on (03) 6220 2900.

**Your comments are welcome:**

*A summary of your working career (beginning with your first position and ending with your most recent position)*

***The aim of this section is to obtain a work history summary of your employment since you graduated. This includes ALL positions you have held both full time wage positions, contract and self employment. If you have recently graduated and have not yet held a full time paid appointment, or are continuing with post-graduate research, just complete Q1and Q1a Part Two.***

***Complete one row to describe each position you have held, STARTING with your very first full time position following graduation and ending with your current position. For each position you are asked to fill in details to describe eight conditions applicable to that particular job. A detailed explanation of the choice options in each of these columns follows. Please PRINT your responses.***

**Column Number**

**1. Status:** Your response in this column will describe the status of your appointment for this position:
**P = full time, wage position**
**C = contract position** (for the purposes of this survey a contract position is one held for greater than a three month period)
**S = self employed**
**CS = self employed contract position** *(this refers to a position where you worked as a contractor and as an independent owner/operator)*

**2. Industry:** What was the industry focus for this position, for example *manufacturing, education, transport, etc.*

**3. Position:** What was the title (and if applicable, status) of this position. If this involves a position with a government grading title (CSO gr1 for e.g.) please indicate the actual work focus involved. For example, project manager (CSO gr1).

**4. Computing professional:** This is a **Yes/No** indication to clarify whether the position was a **dedicated 100%** computing professional position.

**5. Employment duration:** This involves two sections: the **year of appointment** and the **time** ( in months) you remained in this position. (approximations OK)

**6. Organisation:** 2 sections:
**(1) Type:** whether a (**pub**) (public meaning federal, state or local government position), **GBE** (government business enterprise - The Hydro Electric Commission, for example) or a position within private industry (**priv**).
**(2) Size:** where (**S**) indicates small (less than 21 employees); (**M**) 21 to 100 employees and (**L**) is an organisation with 101+ employees.
If contract employment is involved combinations of these categories can be given: i.e. **pubpri, SM** to indicate **(pub/S and pri/M)**

**7• • Location:** In Australia, please supply job location of the position by city, state or if outside Australia, supply name of country.

**8• • Why job change?:** Reasons for changing position, (**I**) = an internal move in the same organisation, (**E**) = a move to another organisation, or (**O**) other.

***For example:***

| 1. Status | 2. Industry | 3. Position | 4. Computing Professional | 5. Employment duration *(approximately)* | | 6. Organisation | | 7. Location of job | 8• • Why job change ? |
|---|---|---|---|---|---|---|---|---|---|
| *(P, C, S, CS)* | ***business focus*** | ***job title (not government position grade)*** | *(yes/no)* | ***Appointed*** *(year)* | ***Time*** *(months)* | ***Type: (pub GBE,pri)*** | ***Size (S,M, L)*** | *(Aust: city, state* Overseas: country) | *(I, E, O)* |
| **CS** | **Education** | **Teacher** | **No** | **1985** | **12** | **Pri** | **S** | **New Zealand** | **E** |
| **P** | **Transport** | **System analyst** | **Yes** | **1986** | **17** | **pub** | **L** | **Hobart, Tas** | **E** |

***If there is insufficient space to list all the positions you have held, please continue using the same format on a blank sheet.***

*A summary of your working career (beginning with your first position and ending with your most recent position)*

| **1.Status** | **2. Industry** | **3. Position** | **4. Computing Professional** | **5. Employment duration** *(approximately)* | | **6. Organisation** | | **7. Location of job** | **8. Why job change?** |
|---|---|---|---|---|---|---|---|---|---|
| P-ft<br>C-contract<br>Wage<br>S- self emp<br>CS-s'emp contract | ***business focus*** | ***job title (not government position grade)*** | *(yes/no)* | ***Appointed*** *(year)* | ***Time*** *(months)* | ***Type*** *-pub public GBE pri - private* | ***Size*** S < 21 M 21-100 L 101+ | *Australia = give city, state*<br>*Overseas = give country* | *I = internal move*<br>*E =external move*<br>*O = other move* |
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***If there is insufficient space to list all the positions you have held, please continue using the same format on a blank sheet.***

**Part Two:**
*The aim of this section is to gather details about your first full time appointment following graduation.*

**1. Have you held paid, full time employment since completing your degree?**

☐ **Yes** *go to question 2* ☐ **No** *go to question 1a*

**1a. If applicable, please tick which of the following describes you current situation:**

☐ seeking f /time employment ☐ enrolled in further full time study ☐ other

***If you responded No to question 1 and completed question 1a, then you have completed your part of the survey. Thank you for participating. Please return the survey in the enclosed self-addressed envelope.***

**2. How did you obtain this position?**
*(please tick the appropriate box/boxes , noting that more than one category could be involved)*

☐ → uni careers service
☐ → extension of existing part time/casual employment
☐ → approach from an organisation (other than an existing employer)
☐ → personal connections
☐ → newspaper advertisement
☐ → other *(please give details in space provided directly below - key words OK)*

Other:

**3. Was your acceptance of this appointment based on any of the following reasons?**
*(please tick the appropriate box/boxes, noting that more than one category could be involved)*

☐ → career prospects
☐ → location
☐ → opportunity to work with leading edge technology
☐ → the organisation
☐ → training opportunities
☐ → travel opportunities
☐ → salary
☐ → Other *(please give details in space provided directly below - key words OK)*

Other:

**4. Were formal qualifications required for this position?**

☐ **Yes** *go to question 5* ☐ **No** *go to question 6*

**5. Give details of the qualification requirements for this position:**
*(please tick the appropriate box/boxes, noting that more than one category could be involved)*

**(a) degree** → ☐ essential ☐ desirable

If applicable, what area of *degree* qualification was required? *(multiple areas could apply)*

**(b) diploma** → ☐ essential ☐ desirable

If applicable, what area of *diploma* qualification was required? *(multiple areas could apply)*

**(c) degree *OR* diploma** → ☐ essential ☐ desirable

If applicable, what area of qualification was required? *(multiple areas could apply)*

**(d) certificate** → ☐ essential ☐ desirable

If applicable, what type of *certificate* was required? *(multiple areas could apply)*
*for eg CNE, CPA:*

**(e) membership** → ☐ essential ☐ desirable

If applicable, what type of *membership* was required? *(multiple areas could apply)*
*for eg ACS:*

**(f) other** → ☐ essential ☐ desirable
*(give details below)*

**6. While in this position do you recall being given career counselling?**

☐ **Yes** *go to question 6a* ☐ **No** *go to question 7*

**6a. Describe how and when career counselling was given while you were in this position:** *(for e.g. during discussions at initial job interview)*

**7. While in this position do you recall being given an opportunity to demonstrate your capabilities with challenging tasks?**

☐ **Yes** *go to question 7a* ☐ **No** *go to question 8*

**7a. Describe tasks you found challenging while in this position:**
*(e.g. responsible for evaluating and supporting the purchase of specific software packages)*

**8. While in this position did you receive any formal training?**
*(not limited to computing related areas)*

☐ **Yes** *go to question 8a* ☐ **No** *go to question 9*

**8a. Describe the areas of formal training in which you were involved:** *(key words OK)*
*(for e.g.: report preparation, user training etc.)*

**9. While in this position, was your performance formally assessed?**

☐ **Yes** *go to question 9a* ☐ **No** *go to question 10*

**9a. Describe the position title of the person responsible for assessing your performance and how were you told of the results?**
*(for e.g. personnel manager, interview etc.)*

**10. Describe any** *positive* **outcomes from starting your working career in this position.** *(key words OK)*

**11. As best you can recall, describe any** *negative* **outcomes from starting your working career in this position.** *(key words OK)*

If while completing this survey you have thought about issues you think should be raised or wish to share particular experiences from you career, please take the time to document these in the space provided at the beginning of this survey.

***Thank you for completing this survey. Please return it in the enclosed prepaid envelope.***

## 6. Descriptive Pamphlet

As a past graduate of the Department of Computer Science at the University of Tasmania your participation is vital to the success of this research. Please take the time to complete the enclosed survey before the 17th July, 1997.

Complete and return the enclosed survey and you will be automatically entered into a draw to win a University of Tasmania plaque valued at $90. It is crafted in blackwood and displays the University crest. The draw will take place at the morning tea break in the Department of Information Systems at the Hobart campus on 28th July 1997 and the result published in The Mercury newspaper on 3rd August 1997.

**Whoops!** while every care has been taken to locate graduates, if in fact we have contacted the wrong person, please accept our apologies for any inconvenience that we may have caused. We will however, appreciate being notified of our mistake. To do this simply tick the following box and return this pamphlet in the enclosed pre-paid return postage envelope. ☐

*Your cooperation will be greatly appreciated.*

**For further information contact:**

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*Department of Information Systems*
*University of Tasmania*
*Post Office Box 252-87*
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*Fax: (03) 6220 2913*
*E-mail: jf_young@infosys.utas.edu.au*

# The Career Paths of Computer Science and Information Systems Graduates

***Research being conducted at the University of Tasmania***

## The Career Paths of Computer Science & Information Systems Graduates

- ***What is the aim of this research?***

The objective is to explore the scope of the career experiences of people who have graduated from the University of Tasmania with an undergraduate major in either computer science or information systems.

- ***Why is this research necessary?***

Ever since computers were commercially introduced in Australia in the early 1960s there has been a shortage of skilled computing personnel Throughout this period a number of government studies have been commissioned to address this problem. Among the recommendations resulting from these reports has been a call for adequate career information to be made available to attract a greater number of people to gain tertiary qualifications and enter the profession.

- ***Why is this research significant?***

This research is significant because at the present time there is only very limited information available to explain employment opportunities for people with formal computing qualifications

- ***What does this research involve?***

This research is a two phase project. The aim of the first was to build a labour market perspective of employment opportunities for IS personnel throughout the period since the Department of Computer Science was established at the University of Tasmania This involved a twenty year, periodic sampling of IS employment advertisements in The Australian, The Age and The Mercury newspapers. From this a comprehensive profile of nearly 3500 advertisements has been constructed.

The objective of this second phase is to compare the different patterns of positions graduates have held since entering the workforce. To be meaningful it is not restricted to dedicated IS positions. In addition it also focuses on the first permanent position gained following graduation

- ***Who will be involved?***

As many past graduates who can be contacted since the Department of Computer science was founded in 1975 are being invited to participate in this survey.

***Within this survey your anonymity is guaranteed***

- ***What information are graduates asked to supply?***

There are two parts to this survey. It is very important to complete both sections. The first involves providing a summary of ***all*** positions you have held ***regardless*** of the job role or industry. This will provide information to allow the identification of similarities (and differences) within the career patterns of graduate employment. The objective is to consider the scope of employment. This survey is not a comparison of career achievements.

Part two is also a very important component of the survey Your responses to this section will provide the opportunity to explore the influences and consequences of initial appointments within a career.

- ***How long will the graduate survey take to complete?***

From the pilot survey the average time involved is fifteen minutes. Based on this your participation should not intrude too greatly on your valuable time.

***Thank you for taking the time to read this pamphlet***

## 7. Student database selection criteria basis computer science/ information technology major

**Arts**

**1987** p158

| | | | |
|---|---|---|---|
| SIS300 | Information Processing 3 | 50% | |
| comprising: | | | |
| SIS310 | Computer Science 3 | | |
| *plus any two of the following:* | | | |
| SIS330 | Computer Hardware 3 | | |
| SIS331 | Simulation | | |
| SIS332 | System Performance Evaluation | | |
| SIS333 | Varieties of Languages | | |
| SIS334 | Robotics | | |
| SIS350 | Compiler Construction | | |
| SIS351 | Artificial Intelligence | | |
| SIS352 | Computer Graphics | | |

**1988**

| | | | |
|---|---|---|---|
| SIS300 | Information Processing 3 | 50% | |
| *comprising 18 points from:* | | | |
| SIS311 | Software Engineering | 3 | |
| SIS312 | Systems | 6 | |
| SIS313 | Languages | 6 | |
| SIS314 | Performance | 6 | |
| SIS321 | Data Structure and Algorithms | 3 | |
| SIS322 | Processor Arch and Design | | 3 |
| SIS323 | Artificial Intelligence | 3 | |
| SIS324 | Digital Image Processing | 3 | |
| SIS352 | Computer Graphics | 3 | |

**1989**

| | | | |
|---|---|---|---|
| SIS300 | Information Processing 3 | 50% | |
| *comprising 18 points from:* | | | |
| SIS311 | Software Engineering | 3 | |
| SIS312 | Systems | 6 | |
| SIS313 | Languages | 6 | |
| SIS314 | Performance | 6 | |
| SIS321 | Data Structure and Algorithms | 3 | |
| SIS322 | Processor Arch and Design | | 3 |
| SIS323 | Artificial Intelligence | 3 | |
| SIS324 | Digital Image Processing | 3 | |
| SIS352 | Computer Graphics | 3 | |

**1990** p122

| | | |
|---|---|---|
| SCS370 | Information Technology 3 | 9 |
| *plus any three of the following:* | | |
| RSY303 | Social Research | |
| RSY304 | Quantitative Methods | |
| RSL300 | Information Retrieval Systems | |
| SCS231 | Commercial Processes | |

**1991** p64

SCS370 Information Technology 3 9
*plus any three of the following:*
RSY303 Social Research
RSY304 Quantitative Methods
RSL300 Information Retrieval Systems
SCS231 Commercial Processes
*Note computer science group 3a subjects still listed.*

**Commerce/Economics**

*Note: the long-standing rule in this faculty is that any group a subjects from Arts or Science crediting 12points is rated at 13.5*

**1985**

| | | |
|---|---|---|
| SIS310X | Computer Science 3 | 12 |
| SIS330F | Computer Hardware | 3 |
| SIS331F | Simulation | 3 |
| SIS332X | System Performance Evaluation | 3 |
| SIS333X | Varieties of Languages | 3 |
| SIS350E | Compiler Construction | 3 |
| SIS351D | Artificial Intelligence | 3 |
| SIS352E | Computer Graphics | 3 |

**1986**

| | | |
|---|---|---|
| SIS310 | Computer Science 3 | 12 |
| SIS330 | Computer Hardware | 3 |
| SIS331 | Simulation | 3 |
| SIS332 | System Performance Evaluation | 3 |
| SIS333 | Varieties of Languages | 3 |
| SIS334 | Robotics | 3 |
| SIS350 | Compiler Construction | 3 |
| SIS351 | Artificial Intelligence | 3 |
| SIS352 | Computer Graphics | 3 |

**1987**

| | | |
|---|---|---|
| SIS310 | Computer Science 3 | 12 |
| SIS330 | Computer Hardware | 3 |
| SIS331 | Simulation | 3 |
| SIS332 | System Performance Evaluation | 3 |
| SIS333 | Varieties of Languages | 3 |
| SIS334 | Robotics | 3 |
| SIS350 | Compiler Construction | 3 |
| SIS351 | Artificial Intelligence | 3 |
| SIS352 | Computer Graphics | 3 |

**1988**

| | | |
|---|---|---|
| SIS311 | Software Engineering | 3 |
| SIS312 | Systems | 6 |
| SIS313 | Languages | 6 |
| SIS314 | Performance | 6 |
| SIS321 | Data Structure and Algorithms | 3 |
| SIS322 | Processor Architecture and Design | 3 |
| SIS324 | Digital Image Processing | 3 |
| SIS352 | Computer Graphics | 3 |
| SIS361 | Information Technology 3a | 4.5 |
| SIS322 | Information Technology 3b | 4.5 |

**1989**

| | | |
|---|---|---|
| SCS311 | Software Engineering | 3 |
| SCS312 | Systems | 6 |
| SCS313 | Languages | 6 |
| SCS314 | Performance | 6 |
| SCS321 | Data Structure and Algorithms | 3 |

| | |
|---|---|
| SCS322 Processor Architecture and Design | 3 |
| SCS324 Digital Image Processing | 3 |
| SCS352 Computer Graphics | 3 |
| SCS361 Information Technology 3a | 4.5 |
| SCS322 Information Technology 3b | 4.5 |

**1990**

| | |
|---|---|
| SCS312 Systems | 6 |
| SCS313 Languages | 6 |
| SCS314 Performance | 6 |
| SCS315 Software Engineering | 6 |
| SCS322 Processor Architecture and Design | 3 |
| SCS323 Artificial Intelligence | 3 |
| SCS324 Digital Image Processing | 3 |
| SCS352 Computer Graphics | 3 |
| SCS371 Information Technology 3a | 4.5 |
| SCS372 Information Technology 3b | 4.5 |

**1991**

| | |
|---|---|
| SCS312 Systems | 6 |
| SCS313 Languages | 6 |
| SCS314 Performance | 6 |
| SCS315 Software Engineering | 6 |
| SCS322 Processor Architecture and Design | 3 |
| SCS324 Digital Image Processing | 3 |
| SCS327 Artificial Intelligence | 3 |
| SCS352 Computer Graphics | 3 |
| SCS371 Information Technology 3a | 4.5 |
| SCS372 Information Technology 3b | 4.5 |

**Engineering:**

**1987**

| | | |
|---|---|---|
| SIS310 | Computer Science 3 | 33.3% |

From 1988

**1988** p32

| | | |
|---|---|---|
| SIS312 | Systems | 16.7% |
| *plus at least one from*: | | |
| SIS321 | Data Structures and Algorithms | |
| SIS322 | Processor Architecture and Design | |
| SIS324 | Digital Image Processing | |
| SIS421 | VLSI Design | |

**1989** p35

| | |
|---|---|
| SCS312 Systems | 16.7% |
| *plus at least one from:* | |
| SCS321 Data Structures and Algorithms | |
| SCS322 Processor Architecture and Design | |
| SCS324 Digital Image Processing | |
| SCS421 VLSI Design | |

**1990** p235

| | |
|---|---|
| SCS312 Systems | 16.7% |
| SCS322 Processor Architecture and Design | 8.3% |
| SCS324 Digital Image Processing | 8.3% |

**1991**

| | |
|---|---|
| SCS312 Systems | 16.7% |
| SCS322 Processor Architecture and Design | 8.3% |
| SCS324 Digital Image Processing | 8.3% |
| SCS419 VLSI Design | 8.3% |

**1992** p271

| | |
|---|---|
| SCS312 Systems | 16.7% |
| *plus at least one from:* | |
| SCS419 VLSI design | 8.3% |
| SCS322 Processor Architecture | 8.3% |
| SCS324 Digital Image Processing | 8.3% |

**1993**

| | |
|---|---|
| SCS312 Systems | 16.7% |
| *plus at least one from:* | |
| SCS419 VLSI design | 8.3% |
| SCS322 Processor Architecture | 8.3% |
| SCS324 Digital Image Processing | 8.3% |

**Surveying: (Computer Technology Stream)**

**1987**
SCS310 Computer Science 3
SCS352 Computer Graphics

**1988** p79
SIS311 Software Engineering
SIS312 Systems
SIS321 Data Struct and Algorithms
*plus any six points from Computer Science Group* 3

**1989** p81
SCS311 Software Engineering
SCS312 Systems
SCS321 Data Struct and Algorithms
*plus any six points from Computer Science Group 3*

**1990**
SCS312 Systems
SCS315 Software Engineering
SCS321 Data Struct and Algorithms
*plus any six points from Computer Science Group 3*

**1991**
SCS312 Systems
SCS315 Software Engineering
*plus any six points from Computer Science Group 3*

**1992** p214
SCS312 Systems
SCS315 Software Engineering
*plus any six points of Group 3 Computer Science*

**1993**
p289
SCS312 Systems
SCS315 Software Engineering
*plus any six points of Group 3 Computer Science*

**1995**

| | | |
|---|---|---|
| KCA312 | Systems | 6 |
| KCA314 | Performance | 6 |
| KCA315 | Software Engineering | 6 |
| KCA322 | Processor Architecture and design | 3 |
| KCA324 | Digital Image Processing | 3 |
| KCA327 | Artificial Intelligence | 3 |
| KCA328 | Systems Programming | 3 |
| KCA370 | Information Technology 3 | 9 |
| KCA373 | Computer Selection and evaluation | 3 |
| KCA374 | Project Management | 3 |
| KCA375 | Information Technology Project | 3 |

| | |
|---|---|
| ACM381 | Engineering Accounting |
| ACM382 | Engineering Project Management |
| ASA 373 | Introduction to GIS |
| HGA303 | Social Research |
| HGA304 | Quantitative Research |
| HGA330 | Qualitative Research |

**Engineering**

| | | | |
|---|---|---|---|
| KCA454 | Engineering Design 3 | (CSE) | 20.0 |
| KCA314 | Performance | | 16.7 |
| KCA322 | Processor Architecture and Design | | 8.5 |
| KCA324 | Digital Image Processing | | 8.5 |
| KCA327 | Artificial Intelligence | | 8.5 |
| KCA419 | VLSI Design | | 8.5 |

## 8. Formula applied for the normalisation of proportional percentages

The proportional percentages presented in Chapter Five and Chapter Six were normalised applying the following formula:

$$1+\frac{(n-1)}{(A-B)} * (A-x)$$

where n = number of categories
A = maximum value
B = minimum value
$x$= value